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The California Desert

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A CRITICAL ENVIRONMENTAL CHALLENGE

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**A PROPOSAL
BY THE
CALIFORNIA STATE OFFICE
BUREAU OF LAND
MANAGEMENT
U. S. DEPARTMENT OF THE
INTERIOR**

JANUARY, 1970





THE SECRETARY OF THE INTERIOR
WASHINGTON

The California Desert once symbolized the hostile land that America crossed to win the west and create our nation. Today, this desert land is symbolic of the new needs of our country.

The wide open spaces of the desert beckon to millions of Americans. In this untrammelled landscape, the great urban population of southern California, only a few miles away, can find relaxation from the pressures of city life.

More important, perhaps, is another symbol of our times---the concern for our overall environment. Long considered a wasteland, the California Desert, like other arid lands, is now recognized as a fragile area where the natural balance is easily upset. It is rich in a multitude of resources: minerals, unique vegetation and wildlife, historical and archaeological values, and unparalleled scenery. But the inroads of our civilization are already evident on the desert: air pollution, solid waste disposal, scars on the land surface, accidental destruction, and wanton vandalism.

We can no longer afford such losses. We must seek to understand the total desert environment so that we may use it wisely. We can only enjoy its benefits when we are assured that we can protect its values to pass on to those who come after us.

Three-fourths of the land in the California Desert belongs to all Americans. It is public domain land under the stewardship of the Department of the Interior and we must take the initiative in working with all those who have an interest in the California Desert to insure that this land will continue to serve the needs of our country.

The following report is a proposal by the Department of the Interior's Bureau of Land Management. It describes the elements of a program that is needed now to meet the needs of the 1980's on the California Desert.

Walter Michel

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"It is the California Desert. But the crash and roar of civilization suddenly shatters its quietude and treads on its isolation. And, for the first time, people are seriously thinking how to save it . . .

"It is tempting to believe still that what the desert holds uppermost for man is not a raceway for his engines, but a crucible for his spirit."

John Waugh
Los Angeles Times
August 10, 1969



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	Mar 1	Interest		5.00	
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ABOUT THIS REPORT

"The California Desert . . . A Critical Environmental Challenge" is a report on the second phase of a study of the California Desert by the California State Office of the Bureau of Land Management.

It is a followup to a report on the first phase of the study. Called simply "The California Desert", that first report was concerned primarily with the recreational use of the desert public domain lands of California. It was prepared with the assistance of the Western Regional Office of the National Park Service.

The first phase of the California Desert Study made specific recommendations for the management of recreation on public lands, but it also led to the inescapable conclusion that all resources and uses must be considered in terms of the total desert environment if sound land management decisions are to be made.

The supporting data for this resulting second phase report were collected by specialists in resource management, including both BLM technical experts and outside consultants. The basic report and its technical supplement have been evaluated by a review group representing Federal, State, County, and municipal agencies.

"The California Desert . . . A Critical Environmental Challenge" consists of two volumes. First is the report itself which consists of an introduction; an overview; a description of the resources, uses, problems, and opportunities on the California Desert; and the conclusions of the study. Second is the technical supplement, with supporting data and other detailed information on the various aspects of the California Desert, including its resources and management problems.

The reader may also want to review the first phase of the study as described in "The California Desert," issued in 1968.

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ACKNOWLEDGMENTS

This report has been developed under the direction of the California State Office, Bureau of Land Management.

The California State Office was assisted by personnel of its Riverside District Office, and by BLM's Portland and Denver Service Centers. Review comments were received from the two Service Centers as well as the Washington Office.

In addition to the help provided by many BLM people, we received valuable assistance from many outside individuals and organizations whose advice and comments have been invaluable.

We gratefully acknowledge this cooperation and assistance and extend sincere thanks to all who have contributed.

The following list includes those who had a part in this work:

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Special thanks go to Robert D. McCulley, Director, Pacific Southwest Forest & Range Experiment Station for his interest and review, and to Vincent Dong of the Station for his technical editing assistance.

AGENCIES

California Region, Forest Service, U. S. Department of Agriculture

Pacific Southwest Forest & Range Experiment Station,
Forest Service, U. S. Department of Agriculture

National Park Service, U. S. Department of the Interior

Resources Agency, State of California

County of San Bernardino

SCAG — Southern California Association of Governments

Bureau of Mines, U. S. Department of the Interior

University of California, Riverside — Santa Barbara —
Berkeley — Los Angeles

Bureau of Outdoor Recreation, U. S. Department of
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U. S. Fish & Wildlife Service

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* * *

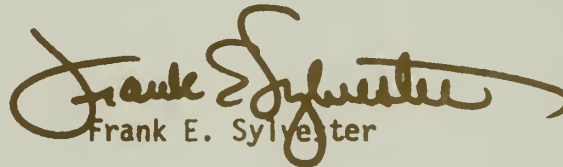
A review committee composed of Frank E. Sylvester, Regional Director, Bureau of Outdoor Recreation, San Francisco; Ford B. Ford, Assistant Secretary for Resources, State of California; and Neil B. Pfulb, Director of Planning, San Bernardino County, furnished guidance and counsel which have been incorporated into this study. Through these people this report has received extensive review by many agencies at the Federal, State, and local government level.

* * *

UNITED STATES
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We have reviewed "The California Desert ... a Critical Environmental Challenge" and are impressed with the emphasis on developing a comprehensive plan for the Bureau of Land Management's desert lands. We are in general agreement with the planning approach and the critical management priorities and we agree that the need for planning and action on the desert is imperative.

The idea of a cooperative effort to assist the BLM on the various studies is good. We are most interested in the progress of the recommendations and stand ready to assist in the development of a comprehensive plan where appropriate.


Frank E. Sylvester



THE RESOURCES AGENCY OF CALIFORNIA
SACRAMENTO, CALIFORNIA

The California Desert is an area of national significance, balanced on the delicate edge of obliteration, which urgently demands a massive effort of resource stewardship. The Bureau of Land Management is proposing such an effort. This report, "The California Desert ... a Critical Environmental Challenge", sets forth a tough job that needs to be done.

Because the protection and wise use of the resources of the California Desert is too big and complex a job for any one agency or level of government to handle alone, the State of California will cooperate with the Bureau in resolving how that job will be accomplished at the earliest possible time.

Ford B. Ford
Assistant Secretary for Resources



316 Mt. View Avenue
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Many county departments and officials, as well as the Executive Committee of the Council of Planning of the Southern California Association of Governments have reviewed "The California Desert... a Critical Environmental Challenge". In an effort as comprehensive and important as this it is understandable that there would be a wide variety of opinions concerning the way it would be conducted, its content, and goals.

However, there has been an almost unanimous expression of support and a feeling of urgency that such an effort be completed as soon as possible to protect and preserve the values which now exist in the desert area. This office is vitally interested and willing to assist BLM in any way possible.

COUNTY PLANNING DEPARTMENT

A handwritten signature in dark ink, reading "Neil B. Pfulb". The signature is written in a cursive style with a large, stylized initial "N".

Neil B. Pfulb, Director of Planning

INTRODUCTION



"The deserts are a part of the world that was used only lightly (and in general unskillfully) by earlier men, but this cavalier treatment can no longer be afforded — there are too many of us now. In some nations where men are hungry, desert lands that once were used, spoiled and discarded are being laboriously brought back to productivity . . . Up to now men have treated the deserts as if they made no difference. One of these days, when survival no longer can be taken for granted on a crowded, used-up earth, they may make all the difference."

THE DESERT

A. Starker Leopold
and the Editors of LIFE

A CRITICAL ENVIRONMENTAL CHALLENGE

It stretches as far as the eye can see. The traversing sun spreads waves of light and shadow. Oases of greenery rise in the bronze landscape, an endlessly varied terrain, rising and falling in ranges of russet-sheathed mountains, their peaks and valleys sculptured by wind, water, and the relentless advance of time.

This is the California Desert — a 16-million acre national treasure. We, as Americans, own more than 11 million acres of the California Desert. This is our public land.

It is in serious trouble.

If we are to act, in time, we must understand the nature of our problem.

Consider:

The California Desert was, until recently, an area of almost untouched open space as large as the State of West Virginia. Its riches include a multitude of resources that can be used in many ways for the betterment of man. It is located within a stone's throw of one of the largest metropolitan concentrations of people in the United States. Nowhere else in the world are so many people in a position to exert such a dramatic impact on a similar area of undeveloped land.

More than 6000 years ago the "fertile crescent" in Mesopotamia was the birthplace of modern civilization. There, man forsook the way of a wanderer, settled down, and tilled the soil. Today that land is stripped, despoiled, utterly ravaged.

On July 16, 1945, desert land in New Mexico was, in one blazing instant, blasted into sterility by the first atomic bomb.

In one short generation the people of southern California have, without malice and surely without desire, transformed the environment of the Los Angeles Basin from one of the most beautiful and beneficial on earth to a place where it appears doubtful that man will be able to live a healthy existence.

The same accelerating technology which has placed men on the moon, and given man the mistaken belief that he has escaped dependence on his environment, has created the possibility of monumental environmental mistakes.

Many of our technological attempts to modify or "improve" our environment have been made with a single purpose in mind, without consideration of their impacts on the total environment. The results have been, in some cases, disastrous; and in others have required tremendous costs to undo the damage. As witness: DDT in Coho salmon; oil in the Santa Barbara Channel; the efforts to rehabilitate the deserts of Israel; the dust bowl; the shack slums on the California Desert; the creation and degradation of the Salton Sea; the internal combustion engine.

The world population spirals upward. The value and importance of every natural resource increases even faster. Today people and industry need and use products of the land that were not even considered a century ago. There can no longer be "waste" spaces on the earth.

The concept of "order" is not new with man. It is a fundamental idea of environment of which man is but a part. As man sees the need

"The sober truth is that our modern technology has come at high price: The unwitting but insidious deterioration of our physical world. And, unless we immediately zero in on this problem with our most powerful technological guns, we run the risk of destroying this earth as a desirable place for life and pursuit of happiness.

True, modern technology has given us much of the good life, but we're beginning to realize there's a serpent in our paradise.

We suspect but don't really **KNOW** what we are doing to ourselves."

Thomas L. Kimball
NATIONAL WILDLIFE



to make peace with man, he must also see the need to make peace with the environment. The people and the land are integral.

The effects of our environmental errors are moving inexorably into the desert. Air pollution in Riverside, at the edge of the desert, caused the loss of much of the 1968 romaine lettuce crop — value about \$7 million. It is killing pine trees in the San Bernardino National Forest, which overlooks the desert. And University of California scientists find evidence that some desert plants are being hurt or killed by smog.

Despite the production of hundreds of millions of dollars worth of minerals, forage, crops, and materials; despite the presence of remarkable historic, cultural, scientific and educational values; despite the sometimes intangible social and recreational use by millions of people every year; there are great gaps in our accumulated knowledge of the California Desert. More important, there has been no effort made to consider the whole, to evaluate the future of the desert in terms of the total environment. Without this evaluation the unchecked, single purpose invasions into the California Desert constitute environmental brinkmanship of the most dangerous order.

* * *

This is why the Bureau of Land Management — the agency responsible for nearly three-quarters of all the land in the California Desert — has undertaken this report, the second phase of our study of the desert.

It is a report to the owners of the land — the American people — and has been written with the help of other Federal, State and local Governmental agencies.

It is our purpose to identify the many elements that interact to form the complex of resources and uses that are the California Desert. And, on the basis of this total desert environment — with its unprecedented people pressures, its overwhelming problems, and its great potential — the report sets forth this challenge for the future.

IT MUST BE THE GOAL OF THE BUREAU OF LAND MANAGEMENT TO MEET THE MAJOR PREDICTED NEEDS OF THE 1980'S FOR THE CALIFORNIA DESERT AND ITS RESOURCES WITH FULL UNDERSTANDING OF, REGARD FOR, AND PROTECTION OF ITS ENVIRONMENTAL VALUES. THE ACCELERATING INCREASE IN DEMAND FOR THE USE OF THE DESERT WILL REQUIRE A MAJOR PROGRAM OF INVESTMENT AND MANAGEMENT. IF THIS GOAL IS GOING TO BE MET, TWO VITAL STEPS MUST BE TAKEN IN THE IMMEDIATE FUTURE.

ONE: DATA COLLECTION AND COMPREHENSIVE PLANNING

Because there is a lack of basic information, limited knowledge of the impact of public demands and uses, and minimum understanding of the environmental interrelationships on the California Desert; a comprehensive, long-range plan, based on sound and adequate data collection and analysis, must be developed for this area. This must be done in cooperation with other Federal agencies, State and local government, private industry, and the public.

"By and large, our present problem is one of attitudes and implements. We are remodeling the Alhambra with a steam shovel, and we are proud of our yardage. We shall hardly relinquish the shovel, which after all has many good points, but we are in need of gentler and more objective criteria for its successful use."

Aldo Leopold
A SAND COUNTY
ALMANAC

"We are a part of nature. We have no choice but to coexist with her and, in view of our own creative evolution that does produce some rapid and extreme change, this is going to take a lot more understanding and effort than we have put forth in the past . . .

If some technologies of the past have been ugly or offensive, does it mean we cannot make them attractive, aesthetic or even blend them into natural surroundings so that they almost dissolve the interface between nature and modern man?

All this is possible — and desirable — but only if we can balance indignation with information and concern with understanding and compromise."

Dr. Glenn Seaborg
Chairman, AEC

TWO: IMMEDIATE CRITICAL MANAGEMENT ACTION

For the protection of immediately endangered irreplaceable values, and for the safety and well-being of millions of desert visitors, an intensified management and protection program for key areas must be undertaken now to meet these critical needs while the comprehensive plan is being completed and implemented.

AN OVERVIEW



"We have already allowed too much abuse of our deserts and must act if we are to preserve this vital area. It has been far too easy to use the desert for development, speculation, dumping, etc. without any regard for the impact of these thoughtless actions."

David C. Williams
Ass't City Administrator
City of Pomona

THE DESERT IN PERSPECTIVE

The deserts of the world — arid lands characterized by less than 10 inches of rainfall per year and generally high temperatures — cover one-seventh of the total land surface of the world, some 8 million square miles.

The deserts of the United States and Mexico include some 500,000 square miles of land surface.

The California Desert extends from the Sierra Nevada and Death Valley south some 240 miles to the Mexican border, and west from the Colorado River over 100 miles to the fringes of the vast Los Angeles coastal metropolitan area. Of these 25,000 square miles or 16 million acres, 17,000 square miles or 11 million acres are owned by all the people of the United States and administered by the Bureau of Land Management.

The California Desert may be thought of as a regional geographical entity. This area is of direct concern to numerous Federal, State, County, and other local agencies. It includes five counties within its boundaries, and has a direct impact on four major metropolitan adjoining counties. It includes many cities and municipalities, as well as hundreds of functionally varied special districts. And much of its area lies within the influence of a regional planning body, the Southern California Association of Governments. It also includes substantial areas of private land.

Physically, the California Desert is not flat and barren sand — rather it is a land of almost infinite variety. Lofty mountain ranges, snow-capped in winter, embrace plateaus, basins, dry lake beds, rivers

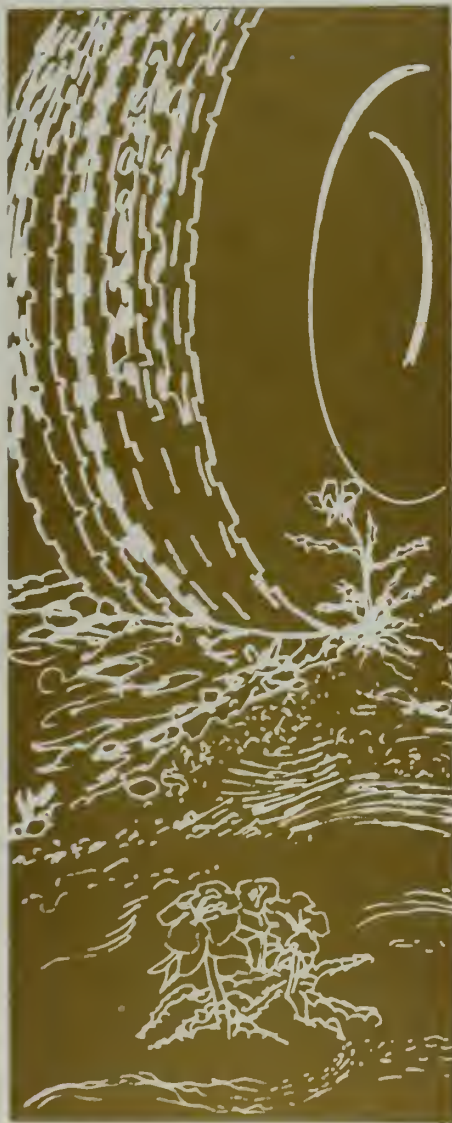
and washes, and a multitude of mineral, botanical, biological, scientific, and social riches.

It is a fragile environment, easily scarred, slowly healed, historically protected only by an inhospitality which modern technology is rapidly making meaningless.

The California Desert has never before been considered as a whole, interdependent ecological system. Information about its parts exists — fragmented, incomplete, unrelated.

To comprehend the California Desert as a whole, the parts must be briefly examined. It will then be logical to consider what makes the study of this area — less than one percent of the world's desert lands — a unique and vital project of national significance to the United States.





THE RESOURCES

SOILS AND VEGETATION

Perhaps nothing contributes more to the fragile nature of the California Desert than its shallow soil mantle. Some desert soils have proved to be extremely productive, but any damage by man can destroy this potential. More than 700 species of flowering plants grow in the California Desert. Much of this vegetation is unique. More than 217 of these plants are found nowhere else in the world. Desert plant species are extremely important for their potential contribution to medicine, for their significance in the study of plant evolution, and for their more direct forage and scenic values.

WATER, WATERSHEDS AND CLIMATE

More than 60 percent of the California Desert is rough and mountainous. Although rainfall averages three to 10 inches on different parts of the desert, it often comes in heavy storms that create violent, brief, heavy runoff waters of great erosive force. The great variations in climate — extremes in temperature and precipitation — are generally known, but their effects on soils and vegetation are not fully understood.

MINERALS

Half a hundred different minerals lie hidden in the California Desert's harsh embrace. The annual worth of those wrested from it exceeds \$160 million, providing an important inflow to the nation's economy. This area holds California's richest on shore mineral potential.

WILDLIFE

The California Desert is host to a fascinating and varied array of wildlife including some native species threatened with extinction. Visitor use of this important resource is rising as use of the desert itself is on the upswing. And evidence points to the fact that non-consumptive uses such as study, photography and viewing, match and may exceed the hunting use. While it may sound paradoxical, the California Desert also supports fish populations that range from a few hundred each of some rare or endangered species to the billions of fish in the Salton Sea and Colorado River, which support a major sport fishery.

LIVESTOCK

More than one third of the California Desert supports vegetative cover which is now or can be valuable for livestock grazing. Though it depends on the unpredictable, often scant rainfall, this resource represents a segment of the desert's productivity which adds to the economy of the region.

RECREATION

The California Desert offers a myriad of unique recreation opportunities, each one drawing greater numbers of people annually. This use will continue to increase, may even reach 50 million visitor-days each year by the year 2000, if the resource is developed.

Never before in history has man so sought the mind-restoring, steam-letting, spirit-refreshing, knowledge-giving opportunities offered by these desert lands.

"The geographical, geological, and other natural history features of our desert domains are so varied and with them are bound up so many entrancing problems that many years of intimate acquaintance and wide travel over the arid Southwest have not desiccated my ardor for continued study and wide wanderings nor lessened my eagerness to lead others to the heart of my kingdom of joy."

Edmund C. Jaeger
THE CALIFORNIA
DESERTS

"What really concerns me is that the same mistakes are not made in recreation as were made in range management. In the history of range management, control came after vegetation and soil destruction. I suspect that you will agree that a history of range land use is already repeating itself in modern recreational problems."

Dr. Harold Heady
Univ. of California

SCIENTIFIC, CULTURAL, EDUCATIONAL

Scientific values to be found in the California Desert include remains of ancient man's past, relics that tell how he lived, worked, and played. The clues gleaned from these remains may help us understand some of the problems we now face.

LAND

Basic to all other resources is the land itself. Land use requirements are varied and many. There are large blocks set aside for parks, military reservations and other government agencies, and these are intermingled with private and State owned lands.

Future land use will have to cope with many different needs which will be generated by population growth, including solid waste disposal, pollution prevention, airports, urban and industrial expansion, commercial uses, and public utilities, as well as the problems of resource use.

THE PEOPLE

"The changing face of the desert reflected the great invasion" wrote A. Starker Leopold about the California Desert in the 1960's.

What "great invasion?"

People.

Try to picture the California Desert, not as a vast expanse of open space, but as a constantly shrinking landscape, surrounded by sprawling cities.

To the northeast — Las Vegas. To the east — Phoenix. To the south — the great agricultural center of the Imperial Valley. And to the west — poised like some gigantic tidal wave — the southern California coastal metropolitan complex from Santa Barbara through Los Angeles to San Diego.

In this complex alone there are 11 million people. About one person for every acre of public land on the desert today.

And tomorrow?

There will be no more land, but there will be more people. How many? Estimates vary, but sometime shortly after 1980 if things continue as they are — two people for every acre. What will happen beyond that will probably be determined by the effect of this wave of humanity upon the area over which it is now breaking.

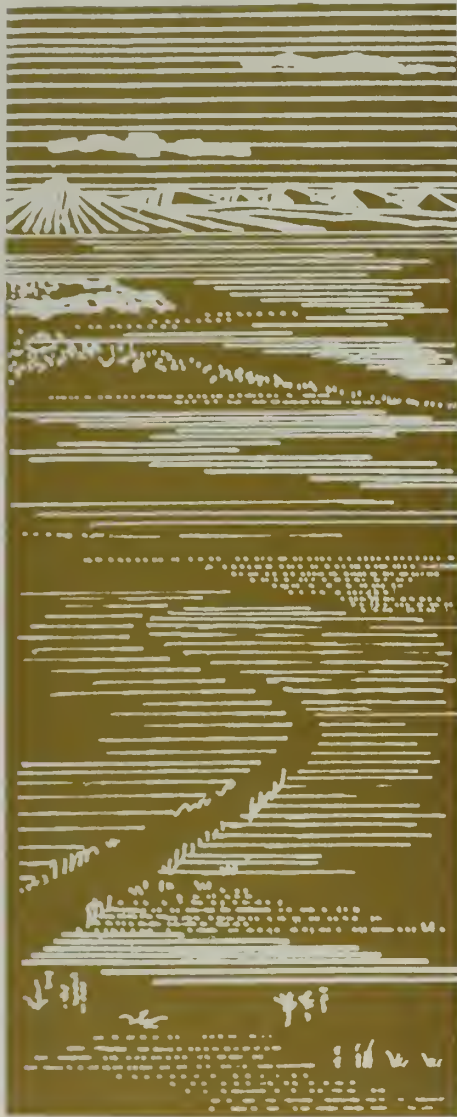
Just what are the sociological, environmental, and economic impacts of this massive population on the California Desert? We don't yet really know.

"We have met the enemy, and
they are us!"

Pogo Possum

"The great question of our time
is whether this mass democracy,
these masses of people, are capa-
ble of the foresight and disinter-
est to solve the environmental
problem of the human race in
this era."

Walter Lippman



What will people dispersion bring?

What will the effects of pollution, waste disposal, water manipulation, resource development, highways, power lines, pipelines, and construction mean to the people who are turning to the desert? We don't yet know.

The basic needs are to determine how man fits into the desert and to provide for his use of the desert. The experiences of man in other deserts indicate that the amount of space a single man would require is measureable in acres, not in tens, but probably in hundreds.

There are sociological and physiological questions that relate to the best use of the desert land for various population groups. What does the individual require to adapt to the desert environment? Heat, salt, and water tolerance affect people living or playing on the desert. What happens in an air-conditioned environment when the power fails? What are the social and economic implications of the kind of development needed to create tolerable conditions for man on the desert, both for short periods and longer stays?

The tremendously increased use of the desert by a population growing as fast as ours demands a study of the interrelationship of man and his desert environment.

The implications are not limited to the desert alone.

There is a pass between San Geronio and San Jacinto Mountains that separates the Los Angeles Basin from the California Desert. It is an escape route for the marine air from the coast. The wind blows,

bringing with it a dirty haze of smog to the desert where it is diluted and disappears.

Is this pass also an escape route from the social tensions that simmer in the urban maelstrom? Does the desert serve to dilute and mollify the destructive pressures built up in people jammed into an urban environment?

We are beginning to see the effect of smog on the edge of the desert. Even here there is not room to dilute enough the ravages of poisoned air.

Will the pressures of too many people also destroy the place in which they seek an outlet?

There are indications that this may already be happening.

But of one thing we are sure. The juxtaposition of these great numbers of people and this great area of arid land is unique; it occurs nowhere else in our country, and it is time we understood what it means.



"In the period . . . that modern man has been permitted to enjoy the delights of city life and have the many comforts that community existence provides, he has learned that great danger to mankind lurks in the existence of cities. City life is an intense life, many times more wearing upon the nerves than country life. It is this strain of city life which increases insanity and brings weaknesses of many kinds to shorten life and deprive the people of their vigor. The best way known by which a community may lessen these ills or do away with them is by increasing park areas and by creating conditions which invite the people to an athletic, out-of-doors life."

Walter D. Moody
WACKER'S MANUAL
OF THE PLAN
OF CHICAGO

WHAT SHOULD BE DONE?

The conclusions are inescapable. By the 1980's overwhelming increases in public demand will be exerted on the lands and resources of the California Desert.

The Bureau of Land Management has responsibility for the public lands which make up the majority of the California Desert area, and BLM must act. Unless we act soon, the Desert faces damage and destruction because of people pressure. But, what can be done? And what should be done?

The Bureau's goal must be to meet the major predicted needs of the 1980's for the California Desert and its resources with full understanding of, regard for, and protection of its environmental values. The accelerating increase in demand for the use of the desert will require a major program of investment and management. In recognition of this goal BLM has undertaken the California Desert Study.

In the first phase of the study, made in cooperation with the National Park Service, the recreational values of the desert were explored. The report from that 1968 study pointed out specific preliminary steps that ought to be taken to preserve and enhance the recreational values of the desert.

The final recommendation of that phase called for an investigation of the total California Desert environment involving Federal, State, and local governmental, and public participation. That led to this second phase of the study. Bureau of Land Management specialists and outside consultants were asked to analyze the major desert resources and

to make a preliminary determination on their importance to the whole desert and to other resources and their uses. They brought together existing data and information.

When all available evidence was marshalled it pointed up the certainty of tremendously increasing demands on the desert in the next decade and the imperative need to gear up for this invasion. As this report points out, it became clear that a comprehensive plan, based on a sound program of data collection and analysis is urgently needed. And, in appraising the situation on the desert today, it became equally clear that some needs are so critical that corrective management action must be undertaken immediately.

"The tremendous population growth in the southern California area is placing unique and heavy demands for recreational as well as other natural resource uses on these fragile desert lands. As a result, the proper development of public recreation as part of an overall management program and careful use of all resources is essential on the desert if this last frontier of public land in California is to be protected and maintained for its many values and productivity in the public interest."

National Association
of Soil Conservation
Districts



PLANNING AND DATA COLLECTION

Because of the complexities and interrelationships involved in resource management a systematic approach to planning for the desert is required. Managers can consider all aspects of resource uses, potentials, and values only if planning is comprehensive. For without an overall appraisal of resources and the establishment of management goals for their use, the individual resource functional plans that are necessary for programs tend to be in conflict rather than in harmony.

The Bureau has now developed a comprehensive planning system. It is a flexible system which can be applied to small or large areas and be used to resolve specific resource problems. It develops a detailed information base, provides policy guidance for decisions and offers a format for making decisions.

The Bureau proposes applying this new system to desert planning. Planning should be completed within five years if action programs are to be carried out in accordance with planning decisions . . . programs that will accommodate user demands and yet protect the environment from further deterioration.

Planning must, of course, be based on facts, and at the present time our knowledge of the desert is not sufficient. What is required at the beginning of the planning process is the initial comprehensive inventory of the desert — the collection of basic data about the resources and their use, and the assembly of data regarding social and economic demands upon the desert.

We have, certainly, learned something of the desert in the first part of this study. We have learned that there are certain critical actions that must be taken immediately to prevent damage and destruction. But what we have really learned is how much there is that we don't yet know.

"We are concerned with the potential damage which air pollution may be causing to desert and brush species.

We have already found evidence of severe damage to agricultural, ornamental and forest species, especially citrus, grapes, flower crops and pines. We think we can see damage from automobile smog on "squaw bush" and it must be affecting many more important brush and desert species but no careful studies have been made. We have hopes that controlled studies with some of these species could be begun soon."

C. Ray Thompson
Research Biochemist
Univ. of Calif. Riverside



CRITICAL MANAGEMENT ACTION

Some critical management actions must be taken now and some developments must be undertaken as soon as possible to preclude damage and preserve existing opportunities. The urgent need for management action concerns not only tangible and intangible resources but also people using and depending on these resources.

The critical management action program that must be instituted immediately includes:

I. ESTABLISHMENT OF A UNIFORMED PROTECTIVE RANGER PATROL.

An adequate system to protect people from hazards and resources from damage is needed. BLM officers should be accorded law enforcement authority. A uniformed ranger force working closely with existing law enforcement agencies is recommended to provide visitor safety, protection, guidance, search and rescue capability, natural resource protection, fire control, general safety, including traffic control, and facility inspection expertise.

II. PROTECT AND PRESERVE THE IRREPLACEABLE RESOURCES OF THE DESERT

Some scientific, cultural, historic and natural values are already succumbing to the increased pressures of man. Unless they are immediately protected by whatever means are necessary they will be forever lost. A few examples can be cited: The Giant Intaglio, a huge pre-

historic land drawing in the Yuha Desert, is being destroyed by vehicles. The old plank road across the Imperial Dunes is being rapidly hauled away or burned for fire wood. The beautiful petroglyphs at Inscription Canyon are being literally quarried. Many archaeological sites that may hold the key to early man's existence in North America are being looted.

The habitat of rare and endangered species of wildlife and fish must be preserved. Some of these rare species of animals and fish live only in the California Desert. In some cases their habitat is in danger of being altered or destroyed. As an example, the habitat of the Peninsular Big Horn Sheep in the Santa Rosa Mountains is threatened by uncontrolled land development. The rare Mojave Chub Fish is in danger because its unique habitat is being altered by the pressure of uses around desert springs.

Some plants that grow exclusively in the desert need immediate protection. The barrel cactus, for example, is being rapidly destroyed by commercial nursery operations.

III. CONTROL THE DESTRUCTIVE AND DAMAGING USES

Destructive uses that are of most concern are those that damage vegetation and the soil mantle. They include indiscriminate off-road vehicle use, improper grazing, careless mining operations and unplanned construction, including road building.

Some areas are already being heavily used for recreational pursuits in an uncontrolled manner that will spoil or destroy them. Some of these

"We doubt very seriously that unregulated use of the fragile desert environment can long continue before BLM will be faced with frightening cleanup and rehabilitation costs, coupled with physical deterioration of many irreplaceable natural and historical features. To perpetuate the environment as the prime catalyst in attracting visitors, facilities and structures must play only an equal role with unique natural areas, historical sites, and scenic beauty. Transposing the creature comforts of home to the desert and funneling visitors to planned recreation nodules over high speed highways would be a disservice to what this magnificent area really represents in opportunity for human refreshment."

Stanton G. Ernst, Pres.
The Assn. of Interpretive
Naturalists

"The pictographs and petroglyphs of San Bernardino County, painted on cave and mountain walls as long as 3,000 years ago by rude desert savages, are now meeting destruction at the hand of civilized man . . . Vandals use them for target practice or disfigure them with chalk and paint. Souvenir hunters pry them off the walls. Builders blast them for construction rock. There are probably between 500 and 1,000 of these sites in the county. Many of them were fairly inaccessible as little as five years ago. But the four-wheel drive and the dune buggy have now brought them within easy reach of the vandals."

Leonard Metz
Sun Telegram-San Bernardino

areas are primarily valuable for their recreational uniqueness, but they are being destroyed by lack of sanitation facilities, and litter — and they pose safety hazards.

IV. INITIATE A CONSERVATION EDUCATION PROGRAM

A rapid expansion of conservation education and information will promote a better understanding of the fragile desert environment. The desert can be many things to many people only if there is an understanding of the complex environmental interrelationships. We recommend the establishment of a Desert Center to provide expert educational opportunities, interpretive services, and guidance. A supporting system of Way Stations located strategically in the desert is also needed to provide information, direction, operating facilities, and interpretive services.

COST AND SCHEDULING

A preliminary analysis of the first two steps required to meet the needs for the California Desert — planning and data collection, and an immediate critical management program — has been made. The work to be done in these two steps has been estimated and is presented here in general terms.

It must be emphasized that the desert is an exhaustible resource of multi-million dollar magnitude and an environment with an important impact on millions of people. The course of action to protect and manage the uses of the total desert environment must be developed on the basis of additional data to be gathered, sound analysis, and a comprehensive plan.

Here, then, is our estimate of what is needed to get the first parts of the job done. Individual fiscal year proposals will, of course, be considered in full detail through established federal budget procedures in the normal course of programming.

ITEM	DESCRIPTION AND TIMING	ESTIMATED COST
I — DATA COLLECTION AND COMPREHENSIVE PLANNING		
Data Collection and Analysis	This would be the initial comprehensive inventory of the desert — the collection of basic data about the resources and their use and the assembly of data regarding the social and economic demands upon the desert. Approximately 11 million acres are involved. This work would be concentrated during the first years of the project.	\$7 Million
Comprehensive Planning	This includes the formulation of policy and guidelines for the desert; framework (multiple use) plans to provide more detailed guidance and coordination and to establish level of development and program needed to meet future demands. This comprehensive planning would be concentrated during the first years of the project, concurrent with the collection and analysis of data. It, in turn would be followed by the development and management plans for each function such as recreation, wildlife, and so forth.	\$3 Million

ITEM	DESCRIPTION AND TIMING	ESTIMATED COST
Immediate Management and Supervision	<p>II – IMMEDIATE CRITICAL MANAGEMENT ACTION</p> <p>This includes all types of resource use supervision, visitor services, protection of the public and the resource, conservation education, and other types of general management effort required for immediate protective management to preserve rare desert values and to protect the public from desert hazards.</p> <p>The required level of critical management must be obtained as soon as possible.</p>	
Investment in Facilities and Resource Development	<p>This includes emergency protective construction to save values now in serious danger, and to provide immediate guidance and information for public protection and guidance. This must be accomplished as soon as possible.</p>	\$8 Million
Total	Five Years from start of project	\$18 Million

PENALTIES OF INACTION

If we fail to heed the urgent needs of the American people for the California Desert, and the impact of the people on the desert, the result will be tragic. Think about some of these penalties of inaction, and then ponder this: isn't this environment and aren't these resources really worth managing wisely for this and future generations?

* * *

Rare or endangered wildlife and plant species may become extinct.

The answers to many unsolved problems in anthropology, archaeology, and paleontology will never be found because of the destruction of these artifacts, fossils, and remains.

The historical remains on the desert, representing dwelling places for Indians and the heritage of the Old West, will disappear at an accelerating rate and be lost to study and public enjoyment.

Scientists will lose opportunities to continue important contributions to man's knowledge of such things as evolution and medicine through the study of the flora and fauna of the desert, including many species that exist nowhere else in the world.

Remarkable opportunities to use the desert as an outdoor classroom and laboratory will be lost to millions of students.

Health and safety hazards, crime, and even deaths of desert visitors and workers will increase.



"If I have any criticism it is that in the long run it may prove that you have yielded too much to current pressures, rather than sufficiently curtailed the rate of environmental degradation. In my opinion destructive use of these natural areas should be extremely restricted, especially the use of wheeled vehicles off established roadways. In judging the apportionment of the landscape, I think more weight should be given to proposals that favor conservation of what is left, rather than weighing proposals according to the numbers within each interest group. Interests can change, but ruined landscapes are not easily restored."

R. Danbenmire
Professor of Botany
Washington State Univ.

Resources will not be protected from fire, flood and greater human use.

There will be a reduction in wildlife habitat. This will mean a loss of wildlife and reduced recreational opportunities.

Failure to plan for and adopt a modern livestock management plan will result in loss of site productivity and potential, and fewer, poorer, animals. Soil erosion and downstream flood damage will increase. The quality of runoff water, and the quality and quantity of wildlife habitat will be lowered. This will contribute toward the instability of the local livestock industry.

Failure to plan for and adopt a realistic mineral management program in known mineral areas will discourage mineral exploration and development, increase title uncertainties, retard economic growth, inhibit multiple use, and result in avoidable destruction of the environment.

Careless recreation use of the California Desert will continue and littering will foul the scenery and cost many thousands of dollars for cleanup annually. Cultural values that are priceless and can never be replaced will be destroyed. Indiscriminate off-road vehicle use will cause damage to the desert.

Failure to plan for and adopt a recreational program for the desert will cut its potential to provide recreation needs by 35 million visitor-days by the year 2000. This will cause significant social and economic losses.

Lack of information on physical and chemical properties of soils and

on desert waters and watersheds will result in inadequate planning, expensive mistakes, and costly rehabilitation measures.

Failure to develop a comprehensive planning effort in the desert will prevent the maintenance of a quality environment.



**RESOURCES, USES
PROBLEMS
AND OPPORTUNITIES**



Man In The Desert Environment

In reviewing the role of man in the desert environment, it is disturbing to find how much urban blight he has already brought and how potentially dangerous to the desert his activities would be if man were left to his own devices, satisfying his conquering urge.

Two factors in the technical papers prepared for this study are presented in a minimal way and yet they are eventually the most important. These factors relate to the sociology and physiology of the human being in the desert environment. The basic need is to determine how man fits into the desert. The experiences of man in various deserts on earth indicate that the amount of space (area) that a single man would require is measurable in acres not only in tens but probably in the hundreds. This is required not only in terms of conservation of the plants and fauna of the desert, but with the understanding that if these are destroyed, the desert moves on and occupies more of the marginal land. To understand this impact of man on his marginal lands, to prevent undue and unwanted uses, and to prepare for future use, it is immediately necessary to measure the microclimate of our deserts. This does not mean isolated weather stations, but rather a close-in look at the environment close to the ground and within a few yards of the surface. Such a study would more effectively provide the information needed for most proper use of this last natural resource.

Basic sociological questions relate to the best use of the land for various population groups. How much space is needed for each group; the miner, the rancher, the recreational user, the indigent population (as the population explosion forces us to use more land for people)? What kind of individuals or social groups should live in the desert — the aged, the young married? How will each group modify the desert? Will the air pollution presently observable in the desert increase because of the presence of more cars, the need for power supplying sources? As people move in will industry with its polluting tendencies also move in? Will this pollution destroy plant life and thus alter the stability of the underlying ground surface (we know this is happening around Riverside)? Will the tendency to develop waste disposal facilities in the open desert increase, and, if so, how will this affect the health and well being not only of the people living there but also of the local plants and animals? Will this additional pollution destroy more than it benefits?

The need for water will increase as people use the desert. How much effect will this ground water pouring into an unstable base affect the health of the user and the desert itself?

If the desert is to be used for the recreational needs of the growing population now living on its fringe, questions arise as to the amount of use any one of the multiple desert areas can tolerate. Does the increased use due to longer "long holidays" mean more rapid destruction? How long a period can a single recrea-

tional area be used before it no longer becomes usable? If areas must be closed off for recovery periods, how much time is required? What are the sociological implications of such closure? Does this mean that we will have a series of barren lands extending further and further into the desert? The present urge of groups, especially our dissatisfied younger people, to demand conservation of natural resources may be markedly reinforced by our failure to keep the desert in a usable state. How will this failure on our part modify, intensify, or depict social revolution? All of these factors must be considered in a study of the desert environment.

At the present time we have primarily only short term (hours to days) experiences in the use of the desert for recreational purposes. The examples of misuse have been startling — what will happen if the use is extended? People are becoming more demanding in their requirements to “get away from each other and their pollution problems.” Therefore, the increased use could engender the same sociological problems that are moving people out of the cities to the desert. “People pressure” on the desert in pursuit of leisure time activities could result in destruction of valuable base recreational facilities. The social consequences of crowding in the heat have not been studied but one should recall the old “black hole of Calcutta”.

The desert has been described as fragile. This

applies not only to its ecology but to its management and the people who may be moving into it. Man living in the desert has had to undergo special physiological and cultural adaptations. The ability of people of different ages to adapt successfully to high environmental temperatures is only partially understood. The physiological problems of salt and water tolerance in excessive heat will need to be understood. Disease states involving such alterations in internal body economy could be markedly affected by the desert environment. There is a need to provide educational centers to inform both the casual visitor and the potential long-term resident as to the problems facing man in the desert. Survival is only a matter of minutes from the excessive heat and a shortage of water. If people live in air conditioned housing, what will be the consequences of a massive power failure such as we recently experienced in New York City? The loss of life and health may be disastrous for the population.

What are the potential sociological impacts of such a disaster? Visualize the slums of Boston magnified a thousand fold.

The key point is that the use of the desert by our burgeoning population will require more studies of the interrelationship of man to his environment. Human ecology is a new science; human and natural ecology cannot be separated. The understanding of one will assist us to understand and appreciate the other.

Geology, Climate, Water, Soils, Vegetation

The California Desert is the unique product of its geologic and climatic heritage. To understand the strengths and limitation of the desert for resource production and use, we must first sufficiently understand its parent characteristics through inventory, study, and analysis.

Geology

Contrary to popular conception, geomorphology and topography of the California Desert are as varied as that of more humid regions. The desert is characterized by many fault blocks and intensive bodies of igneous, sedimentary, and metamorphic rock dissected by long, broad drainages. Most of the drainages end in barren dry lake beds or playas with no exterior drainage. A lesser number of like drainages are tributary to the Colorado River, which flows into the Gulf of California. Rock formations of all geologic eras are present. They range from metamorphic masses 600 million years old to geologically recent basaltic volcanic flows. Among the geomorphic oddities that make the desert unique are the Cima Dome, Cinder Cones, Trona Pinnacles, Mecca Hills, and the Imperial and Kelso sand dunes.

Topography varies in elevation from 282 feet below

sea level in Death Valley to more than 10,000 feet in the perimeter mountain ranges to the southwest and west. Interior mountain ranges vary from 3,500 feet to 7,500 feet in elevation, with broad valley fills averaging around 2,500 feet. Generally, hills and mountain sides are steep with numerous, high gradient, rocky canyons which end in boulder strewn fans where they enter the valley. Fans from the many canyons often coalesce — tending to bury the mountains in their own debris.

Climate

Climatically, the desert is hotter in summer and has less rain than any other region in the country. Rainfall in the interior and along the Colorado River averages 3 to 5 inches at lower elevations and 6 to 10 inches in the intermediate mountains; most of this precipitation comes during the winter months. The higher elevation perimeter mountain ranges exceed 25 inches of precipitation and provide some runoff water from melting snow and spring rains.

Temperatures along the Colorado River and in the lower elevation Salton Sea and Death Valley areas commonly rise to 100 degrees for about 100 days or more during summer months. Average lows for the same periods are in the 70's. Winter daytime temperatures range from 55° to 60° and nights are commonly in the 30's.

Evaporation of surface water bodies has been measured at ranges of 60 to 86 inches annually as compared to 36 inches in the Sierra Nevada.

The length of the growing season is commensurate with temperature fluctuations, resulting in a range of 150 to 330 frost-free days that vary generally with elevation.

These records are from 45 precipitation-recording stations of the USGS at scattered locations throughout the desert. In addition, the USGS has 14 rain gauges at other locations. Some records are continuous over a 30-year period. More complete weather recording is needed locally to measure evaporation, humidity, and wind direction and velocities.

Soil

Perhaps nothing contributes more to the fragile nature of the desert than its shallow surface soil. Because of a lack of weathering processes found in more humid climes, soils formed in place are poorly developed and immature. In many areas wind rather than water is the chief vehicle of soil particle transportation as is evidenced by shifting sand dunes and broad erosion pavements. In fact, most of the desert surface is covered with sands and fine gravels, indicating removal by wind of the finer clay and silt particles. Surface soils of terraces and flood plains are, for the most

part, formed from the adjacent parent rock, although some shifting by wind is apparent.

Damage caused by man's disturbance will reduce the capability of soils to provide the necessary nutrients for vegetative growth. As population pressures intensify, the need for land with soils capable of producing vegetation, forage, and agricultural crops will increase. Therefore, lands with the potential for production should be identified and properly managed to conserve them for future use.

Approximately 6.5 million acres of BLM lands have been inventoried by the U. S. Bureau of Reclamation or the Soil Conservation Service. BLM must now interpret these surveys for management purposes. An additional 4.5 million acres of BLM lands are in need of a low-intensity inventory since these have not been surveyed as yet. The survey proposed would include broad soil groupings, associated vegetative species, and an analysis of soil characteristics. More data are needed on the nature, properties, potential uses, and the effects of climate on desertwide soils, and soil vegetation associations.

These inventories will provide information on the effects of watershed management practices in runoff and sedimentation, on plants best suited for forage and protective cover, guidelines for construction of

roads and recreation sites, or agricultural uses, and on surface mining operations.

First priority for soils inventories should be areas where intensive development and uses are taking place or are imminent. Lacking manpower, BLM could contract for such surveys and apply BLM interpretations to such surveys.

Water

Normally, surface water runoff is inconsequential from the vast 10-inch-or-less precipitation zone, all of the normal rainfall infiltrating the soil for only a few inches. However, occasional convective storms of short duration but extremely high intensity occur which in more populated areas, and possibly here in the future, would be catastrophic. Walls of water, mud and boulders several feet in depth have been observed rushing from canyon mouths at speeds estimated at 400 to 600 feet per minute. Luckily, most of these occurrences have been in undeveloped areas where damage has been solely to highways and railroads. Lack of adequate planning as the desert is developed will result in costly rehabilitation and possible loss of life as these sequential storms occur.

To manage these watersheds properly and plan for safe and orderly habitation, documentation through gauges, photos, and measurement of flash flooding is

needed now. Potentially hazardous flood plains and public areas should be posted to warn unsuspecting tourists and recreationists. This is an urgent need since much of the present recreation use centers around and in the pleasant and easily accessible "dry washes."

Flooding has also occurred along the two existing perennial streams. Both of these, or rather their tributaries, arise in the mountains that form the southwest boundary of the desert. Streams are fed by snow melt often augmented by warm spring rains which cause downstream flooding as the flows combine.

One stream is the Mojave River originating in the San Bernardino Mountains and flowing generally north and northeast through the communities of Victorville, Barstow, and Afton. Flows for normal years are gentle, and what water is not diverted for urban and agricultural use seeps into and disappears in the stream bed. The channel extends for a total distance of 105 miles, ending in Soda Lake and has a watershed area of about 217 square miles. The most damaging flood on record occurred in 1938, when an estimated \$200 million of damage was caused to dwellings, businesses, and cropland. To contain occasional flood waters and to provide for a longer time period of distribution of available water, the Bureau of Reclamation has proposed a dam location above Victorville for water storage of 125,000 acre feet.

The second perennial stream is the Whitewater

River which flows south through the Coachella Valley and into the Salton Sea. This surface flow has also limited use for urban and agricultural developments.

A third river is the Amargosa, which originates in Nevada and ends in Death Valley. The channel is well defined but surface flows of appreciable amounts are sporadic. Sufficient water persists where it is forced to the surface to sustain small native fish populations.

Records of sedimentation other than from live streams is non-existent. At present, the most reliable method of determining the normal sediment yield from watersheds is the PSIAC system presented by the Water Management Committee (Oct. 1968). This system indicates a desert yield of 0.2 to 0.5 acre feet for each square mile of area annually. (As a matter of comparison, 0.2 ac. ft. = approx. 323 cu. yd. or .0004 inch from 1 square mile). As expected, a low rainfall zone will yield very little sediment. However, this system does not account for or record the devastating cloudburst type of storm that can result in removal and displacement of hundreds of tons of soil material within a period of a few hours. Studies are needed to record these events, their magnitude, and extent of soil removed. In addition, localized studies are needed to provide information on the effects of man and animal activities on soil movement.

Ground water has been logged from hundreds of

wells throughout the desert basins. However, since most of these wells were drilled for domestic or livestock water, actual underground quantities available cannot be determined accurately at this time.

One author suggests that many millions of acre-feet are stored underground at reachable pumping depths, but he does not predict the rate of recharge or the time required to completely deplete the purported supply. He does, however, conclude that the only recharge must necessarily come from seepage of existing perennial and ephemeral water channels. Overdrafts of available underground water supplies are common in the western arid regions and the Mojave Desert region is no exception. Recent studies showed a decline of 4 to 6 feet annually in the Antelope-Mojave region and an annual overdraft of 160,000 acre-feet in the underground supplies. Similar overdrafts have been predicted for other basins in the desert by the BR Inland Basin Reports and by the California Department of Water Resources in cooperation with USGS.

More than any other factor, the availability of water will determine the rate and extent of growth of the many millions of acres in the desert. This is applicable to urban and industrial growth as well as irrigated agriculture. Because of this, the need for more accurate methods of measuring underground quantities and overdrafts in individual basins is urgent.

The quality of both underground and surface water

flows is also a prime consideration in present as well as future desert development. Studies by state and federal agencies indicate a wide variance in chemical quality of pumped and flowing water. Variation is due chiefly to the highly diversified minerals in the parent rock material. Additional salts and nutrients are being provided by agricultural and urban drainage in increasing amounts. Quality of water pumped for irrigation and domestic use presently varies from a few hundred parts per million of dissolved solids to many thousands of parts per million. Water with over 3,000 p.p.m. is injurious to many agricultural crops. Inconsistency of quality between adjacent wells in many basins emphasizes the need for additional ground water studies to locate recharge sources and to relate quality of existing ground water supplies to the chemical composition of adjacent soils and rocks. The same absence or shortage of a solvent in the form of precipitation that retards soil formation is also restrictive to vegetative production.

Vegetation

Except for riparian vegetation, desert plants consist of species that are adapted to utilize all of the normal rainfall or snow melt. Since moisture is limited, plants are farther spaced and interspaces are of bare soil or are gravel and/or rock strewn. This condition provides for susceptibility to erosion by prevailing winds and above normal intensities of rainfall or waterflow. Ninety percent of the desert soils support this sparse

but large variety of plant life. In addition, to the aesthetic value, this cover is also useful for watershed protection, wildlife habitat, and livestock grazing. The dominant species are creosote bush and burr sage both of which are slow growing perennial shrubs ranging in height from 1 to 6 feet, depending on soil and moisture conditions. Interspersed with these and other less common shrub species are numerous annual grasses and forbs. Perennial grasses are found on more favorable sites at higher elevations. Stands of Joshua trees covering large acreages of the plains and mesas form the overstory at many locations. Stands of juniper and big sagebrush, not commonly arid desert species, persist at elevations of 5,000 to 7,000 feet in somewhat higher precipitation belts. Generally, trees growing naturally are restricted to ephemeral or perennial stream beds or in areas where water tables are close to the surface. The most common of these are smoke tree, ironwood and palo verde. Rare and/or unique species include the California fan palm, saguaro cactus, crucifixion thorn, dune primrose, desert holly, desert lilly, and ocotillo. Without specific protection from man activities, most or all of these latter will disappear from the desert scene. About one-eighth to one-fourth of the flowering plant species in the desert are endemic to the areas where they are found.

These plant communities are part of the delicate biological balance of the desert. Their importance in Watershed protection and wildlife habitat cannot be overemphasized particularly since most species can be easily destroyed and not easily replaced.

Actual destruction of the vegetative cover is occurring in many portions of the desert and will accelerate in direct proportion to the indiscriminate growth of unregulated recreation.

An inventory of off-road vehicle use areas identified 22 separate sites covering a combined area of 134,000 acres and a trail distance of 940 miles. Most of this use is destructive or damaging to vegetation and soil, resulting in loss of site productivity. Continued inventories and formulation of regulations are needed to predict future impacts of this type of use and to prevent indiscriminate widespread damage.

Other Activities

Other activities by man which disrupt or destroy the vegetative cover or soil mantle include mining and exploration, road construction, overuse by livestock and unauthorized vegetation harvesting. Studies are needed to provide guide lines for control of unnecessary disturbances and unauthorized uses and to determine possible rehabilitation measures. In the final analysis, climate, soil, vegetation, hydrology, and watershed characteristics are so closely related that complete inventories of each of these elements are needed to provide sound comprehensive plans for any present and all conceivable future uses of the desert. The urgency for immediate action in the desert is reflected largely in two areas of concern. The first is the potential hazard to human lives by unpredictable flooding, and

the second is the imminent loss of irreplaceable endemic species of plants through lack of identification and protection. Secondary considerations of comprehensive planning include protection of the desert watersheds and their many resources for the enjoyment of and development by future generations.

Wildlife

The California Desert is important wildlife habitat for many wildlife species, particularly endemic species. Management of this habitat is mandatory for the perpetuation, and even survival, of wildlife in this area, and for the proper human utilization of the wildlife resource.

Wildlife management consists of both management of the animals themselves, and management of the habitat. BLM's responsibility is habitat management on the public domain. The California Department of Fish and Game is primarily responsible for the wildlife. In any wildlife management program for the Desert, however, close coordination is essential.

"Wildlife" includes "fish" in the BLM program. Each will be covered separately, in this report.

Nonconsumptive uses — such as viewing, photography, and scientific study — of wildlife resources in the California Desert are responsible for more visits than hunting. About 60 percent of the 1.9 million visits spent in the Desert in 1965 were for nonconsumptive uses, with their value estimated at between 6 and 17 million dollars. The value of the 760,000 visits spent in hunting is estimated at between 5 and 13 million dollars. This use is in addition to that identified in the Recreation Section. A "visit," here,

varies from a brief period to 24 hours of use. The present number of consumptive and non-consumptive visits will undoubtedly climb at a higher rate than that of growth in population. Although the dollar value of wildlife resources is hard to project, it will most certainly increase by at least the same rate as visitor use.

The Desert's wildlife resources now seem adequate to sustain present use. But they will not be able to do so under projected additional use without a fully planned program of management. And without management, the wildlife resources will probably dwindle, at a rapidly accelerating rate within the next 10 to 15 years.

All evidence points to significant losses in habitat — even though quantitative data are not available. These losses are also a consequence of conflicting uses of the Desert's resources. Bighorn sheep, for example, have lost some habitat and suffered losses in number because of human appropriation of vegetation, water, and space. Deer habitat has probably been lost in some places because of domestic sheep grazing in the northwest part of the Desert Study Area. These are but two examples of conflicts in use of resources. The compatibility of any wildlife species with the various forms of intensive recreation use is not thoroughly understood. But there is enough evidence to suggest the need for research.

Animals

Nearly 200 vertebrate species are found in the California Desert. Found here are a large variety and number of nongame animals, many of which are unique to the Desert area. Examples are the bighorn sheep, desert tortoise, and roadrunner. Important upland game include quail, chukar, dove, rabbits and hares; deer are the main big game species.

As a first step, a wildlife inventory and then habitat management plans must be completed. Some research is needed on basic biology and ecology.

Present Bureau habitat inventory shows the general locations of major wildlife species in the Desert, but this information is inadequate for planning. We need to complete a detailed inventory for all wildlife species, including reptiles, amphibians, and arthropods. This inventory would provide us data on present and potential habitat, areas that can be used for study and management, relative needs and priorities among areas, management alternatives, and resulting recommendations that can be used in resource planning.

The number of snake and lizard collectors roaming the Desert suggests the growing public interest in herpetology. The habitat of Desert animals is being destroyed each day because of urban encroachment, intensive recreational uses, road construction, and

mineral exploration. Some species are so restricted in their habitat that they are not compatible with other uses of the Desert. Only a minimum of planning and management has been done to protect the reptiles and amphibians that live in the Desert. Plans must be developed to protect and manage the habitat for these species.

Fish

Fish in the Desert? It may seem paradoxical to think of the California Desert as a source of fish. But then the Desert is not all sandy dunes. Fish thrive in the Salton Sea and its tributaries, in the Lower Colorado River complex, and in the canals, ditches, and peripheral streams near the Desert's western boundary. Fisheries there attract some of the heaviest angler use in the State.

It is mandatory that BLM work closely with the California Department of Fish and Game on fisheries problems in the Desert area. Management of the fisheries by the State has considerable effect on the public lands managed by BLM and vice versa.

Dwindling in numbers are the severely restricted populations of small desert fish that interest primarily the naturalist, ichthyologists, and student of natural history. These restricted populations suffer from com-

peting uses of water. And much of the remaining favorable habitat is on private land.

The 5,000 miles of canals transporting water from the Colorado River hold what is essentially an untapped fishery. But how to manage it remains a problem for the California Department of Fish and Game, and for BLM, who would be involved with the associated public lands.

The Lower Colorado River complex faces serious problems. Extensive channel changes and removal of salt cedars and streamside vegetation are having unfavorable effects on aquatic habitat. The future magnitude of the sports fishery and spillover effect on nearby recreation sites are creating a problem in recreation management.

The increasing salinity of the Salton Sea is considered the No. 1 fishery problem in California. If the situation becomes worse, there will be a gradual decline in fish populations and the entire fishery may be lost. The use of this area will have increasing impact on the adjacent public lands, especially if the fishery problem is solved.

Destruction of desert fish habitat has been primarily from diversion of water for other purposes, and from lack of protection of springs from livestock. Some of the small springs have warm water that tempt people to introduce tropical fish. The introduction of tropi-

cal and other non-indigenous fish has caused serious competition and crossbreeding. Some populations have been completely displaced. Remaining populations need to be protected from collectors.

Protection of the present habitat can potentially save some of the remaining populations of rare desert fish. With artificial water development and additional work on spring areas, present fish populations could be shifted to suitable habitat — and their numbers doubled or tripled.

The Bureau is responsible for protecting the habitat of rare and endangered wildlife species in the Desert's public lands. It should take an active part in habitat inventory, and in the protection and development of restricted populations of desert fish. It should collaborate with various agencies, universities, and organizations that have an interest. In addition, the Bureau ought to:

1. Obtain from qualified scientists and specialists, recommendations for fishery protection and enhancement, and for development of an action program for the desert fishes.
2. Assist in studies of fisheries and the relationship of the public lands for the irrigation canals, peripheral streams, the Lower Colorado River, and the Salton Sea.
3. Inventory and eliminate fishing access problems on public lands.

Livestock Grazing

Grazing by cattle and sheep has long been a part of the California Desert scene. More than 90 years ago, a few hardy individuals, some owning private desert lands, set out the first animals to feed. Since then, these numbers have varied up and down. Now in years of good forage growth, nearly 20,000 to 25,000 cattle, and 100,000 to 140,000 sheep graze in the Desert.

Within the Desert are nearly six million acres with forage plants considered suitable for livestock grazing. About 2.5 million acres are of a mixed perennial-annual vegetative type, and about 3.5 million acres produce a pure annual plant type.

Livestock grazing of these range lands is largely a case of feast or famine. During an average 5-year period, the forage production of two of the years on the annual range is usually so low as to be unusable, while one year produces such an abundant crop it cannot be fully utilized. Of the two types, the perennial-annual range is more dependable for forage each year and, therefore, best suited for sustained livestock grazing.

Over-all, the yearly forage production in the Desert fluctuates considerably, making it highly undependable as a stable source of livestock feed.

Limited studies to date suggest that about half the

perennial-annual ranges are in unsatisfactory condition because of the lack of proper management. Conditions in the annual range have not yet been evaluated adequately.

The balance of plant life in this Desert is easily upset, and once this occurs the rebuilding process is much slower than in zones of milder climates and higher rainfall. Desert shrubs used for livestock forage on the Desert Experimental Range in Southern Utah have taken 25 to 35 years to progress from poor or bad condition to good even under intensive management. The California Desert is more arid than the Utah Desert and, therefore, expected progress should be even slower. Therefore, adequate knowledge and proper management of the forage resource is critical.

The Bureau manages its rangelands in the California Desert by granting acreage allotments through leases and licenses to qualified livestock operators. Livestock use is authorized on a year-long basis with minimum direction or control from the Bureau.

A number of range improvements have been made to make forage more accessible to animals and for ease of managing them. The present intensity of management may be adequate in some areas. But a considerable acreage reflects unsatisfactory range conditions and needs more management.

To provide for proper livestock use in the future,

it will be necessary to inventory the grazing resource, evaluating its capabilities, and consider conflicts with other uses. Management objectives can be set providing for livestock and plant needs and for systematic planned use and development of the range.

The objectives will recognize the role of livestock grazing use in the environment, and provide for the economic, social, and resource advantages which proper livestock use can provide.

To date, nearly 1.5 million acres of range have been inventoried. A minimum of another 2.3 million acres needs to be surveyed with various analyses required on the total six million acres having forage capability. Appropriate management plans need to be completed on these grazing areas having resource problems.

The demand for forage will remain, but the opportunity for supplying it on the Desert will change because of competing uses of the land and because of economic considerations. Present thoughts are that Bureau managers cannot significantly increase forage by techniques such as seeding or reseeding in the California Desert. Grazing management can, however, assure a better vegetative ground cover and a more stable forage supply. Such a cover will help sustain an existing livestock use and will enhance the value of other resources, including watershed, wildlife habitat, recreation, and scientific values.

Scientific, Cultural, and Educational Resources

Locked somewhere in the once remote vastness of its mountain ranges, plains, and dry lake basins, the California Desert holds secrets of man's past and, perhaps, keys to his future.

Unfortunately, the pressures of too many people on the Desert today are eradicating many of these clues about our yesterdays and tomorrows before they can be discovered, understood, or appreciated. These values can be summarized in three major groupings.

Scientific, which includes archaeological, paleontological, and ecological values,

Cultural, which includes the ethnographic and historical values of the Desert, and

Educational, which includes the use of the Desert as a classroom, an outdoor laboratory, and a place to study what is known about the environment of this unique land.

Archaeology-Paleontology

The answers to many unsolved problems in anthropology, archaeology, and paleontology may lie in the California Desert.

But studies there of man's primitive culture, fossil

animals, and plants are more and more often frustrated by the destruction of relics by "pot hunters," construction, and the thoughtless hordes of people who are trampling, gouging, and driving over the Desert without knowing about damage they are doing.

Desert relics are often found on or near the surface, and many are not obvious except to a trained observer. Therefore, they are very susceptible to destruction. And once destroyed they are gone forever.

There are major new discoveries being made today in the Desert. The possible evidence of "Early Man," much earlier than anyone had thought possible, is being explored north of Barstow. This may be the most exciting archaeological find in the western hemisphere. Only recently, the remains of a bird with a gigantic wingspan — over 17 feet — were discovered in the Desert.

An early relative of the Condor — the largest flying bird ever known — and early man in the Desert — what other secrets are out there to be unlocked?

About 90 percent of the Desert has never been systematically surveyed by competent archaeologists, yet we know already of over 1,000 archaeological sites, and numerous fossil deposits.

Despite the knowledge of these sites, and both Federal and state laws protecting antiquities, relics are being destroyed or removed every day.

It is essential that some enforcement personnel be put in the field immediately to protect these areas; that, where needed, developments be provided to protect them, and that the systematic scientific study of these values be undertaken as soon as possible. This knowledge is essential before construction, development, or other land use practices which could otherwise inadvertently destroy these traces of the past without their ever being recorded or, if their value required it, protected.

Ecology

The study of the flora and fauna of the Desert, many of them species that occur nowhere else in the world, and their relationships with the climate, terrain, and each other is of the utmost scientific value.

Nowhere else do we have the opportunity to learn about not only the evolutionary processes and the dynamic balance of the Desert, but of the relationship of man to the Desert.

Long-range studies of population dynamics can be particularly informative in our understanding of the fluctuations in response to climatic conditions. One such study, started near Pear Blossom in the Western Mojave Desert in 1944, continued for 24 years until the area was destroyed by construction!

The conclusion is obvious. A selection of ecologi-

cal reserves for scientific and educational purposes in the Desert should be made with consideration of all the uses and resources of the Desert.

In the meantime, those key ecological areas and flora and fauna of known scientific interest must be protected.

Cultural

The California Desert was a dwelling place for Indians for thousands of years before the white man came.

From the time the first explorers crossed the Desert until the turn of the present century, the Desert was a place to be crossed or explored primarily for its mineral potential.

Indian relics, the old trails, transportation stations, military posts, and the ghost towns and mines exist throughout the Desert. But as people are returning to this land in great numbers today, these records of the past are being destroyed by vandals, collectors, and unthinkingly, by those who are ignorant of, or ignore, their values.

These relics, too, need immediate protection and full consideration in the future use of the Desert.

Education

How is the modern American, urban oriented and

immersed in his technology, to learn about this land in which he lives?

There are more than 2½ million grade and high school students in southern California and a million more college-level students. In recognition of the public opinion which recently placed conservation and environmental issues as the third most important in California — close behind crime in the streets and high taxes — the California legislature has just enacted a law that requires the teaching of conservation and man's relations to his human and natural environment in all grade schools.

One of the best ways to do this is to take the students into an outdoor location.

In southern California, where will they go? The nearby mountains are full of people. The beach areas

are overcrowded. In fact, tidepool areas on the southern California coast were being so badly picked over that sanctuaries had to be created to preserve them.

The California Desert offers remarkable opportunities for classroom study. Already, scores of educational institutions use the Desert as an outdoor classroom and laboratory.

No system has yet been fully developed for identifying and preserving the areas that will be needed for educational activities. And no guidelines have been developed for relating these educational uses to other resource programs.

If these needs are not soon identified, sites for study may never become available because of encroachment from other incompatible land uses.

Minerals

The Desert Area holds California's richest mineral potential. Each year it yields more than \$160 million worth of raw minerals as they come from the ground. In refined or converted form the worth of these 50 individual mineral commodities are increased many fold. By 1980 the yield from the mines will be at least \$300 million, according to an estimate by the U. S. Bureau of Mines.

Probably the biggest obstacle to mineral development and management is the massive number — 250,000 — of located mining claims. Most of these claims — more than 95 percent — are believed to be invalid because of lack of mineral discovery. Of the total number of claims, probably not more than 500 would meet the test of validity. Mining operations will in all likelihood occupy only a very small percentage of the land. The U. S. Bureau of Mines has estimated that by the year 2020, mineral land will occupy only 56,000 acres in the California Desert.

Therefore, it is principally the claims of questionable validity and those located for questionable purposes that conflict with other uses of the desert, such as grazing, wildlife, urban development, and recreation. Mining and recreation can be compatible and not in conflict. Old mining camps of the West are prime focal points of tourists. With a realistic manage-

ment program, mining can complement a public recreation and tourism program.

The need for an active minerals management program is an obvious necessity. But before such a program can be carried out, there needs to be created understanding among industry, government and the public. And such a program must benefit all three.

For such a mineral program to be basically beneficial to the public, it must help meet the public's great demand for minerals and still protect the overall desert environment. For such a program to be acceptable to industry, it must be in accord with the principles of the basic mining law of 1872 (to encourage the exploration for and the development of the mineral resource) and create an environment in which industry can operate with confidence and free of harassment. For the program to be acceptable to the surface owner and the Bureau, it must provide for ease and economy of administration, and be compatible with other resource programs.

To retain the basic mining law of 1872 and meet these general requirements, supplemental legislation is required. The Secretary of the Interior on August 29, 1969, outlined proposals which appear necessary for accomplishment of our present-day objectives of mineral development; conservation, and well-balanced multiple-use management of the public lands. Suggested changes were:

1. Revision of the patenting procedures to grant claimants a patent only to subsurface mineral resources with a right to use so much of the surface as is necessary for mining and related activities. Preference should be given to the patentee in any sale of the remaining surface rights.
 2. Provision for realistic increases in the purchase price per acre for mining claims upon patenting. Such increases should adequately reimburse the Federal Government for expenses incurred in issuing the patents. Prices established in 1872 are far from in line with prices of today.
 3. Retention by the United States of surface rights should be accompanied by a provision enabling the Federal Government to exercise a reasonable degree of control over the impact upon the surface and environment as a result of mining and related operations.
 4. Elimination of the distinction between lode and placer claims. Countless problems have been caused by this needless distinction, and it is generally agreed it serves no useful purpose.
 5. Establishment of a means to clear the public land of stale and abandoned mining claims. The present system is ineffective and extremely expensive. As a result, very slow progress has been made in clearing public land of questionable claims which adversely affect both the mining industry and the public interest.
 6. Elimination of local laws and customs for the regulation of claims locations and the establishment of clear and modern federal requirements applied uniformly which recognize the technological developments made in the mining industry. These regulations should require claim locations to conform to the lines of public survey and follow the description of legal subdivisions as closely as possible.
 7. Elimination of extra-lateral rights. Amend existing laws to provide that mining claims include only minerals within the vertical extensions of claim boundaries.
 8. Establishment of a system of pre-discovery claims subject to reasonable requirements for time of development. This should provide necessary protection for one engaging in exploration with reasonable diligence intending to develop any workable deposits found.
- The location of mining claims for purposes other than mining is one of the Bureau's most perplexing and expensive problems and requires a vigorous program to terminate such use.
- A possible mineral management plan would be to consider the Desert Area a pilot area for the trial, de-

velopment, and refinement of a new plan, including the development of regulations. All existing claims would be examined for validity. Those found not meeting the test of validity would be contested. Under proposed general legislation, miners and companies wishing to prospect would utilize a system of pre-discovery claims subject to reasonable requirements for time of development.

When considering the prime importance of minerals, we believe such a program could stimulate pri-

vate mineral production in the Desert Area by some \$50 million to \$100 million per year over and above the present rate. It could also make possible a mineral materials sales program that could yield revenues of at least \$1 million a year to the Government. The ultimate gain of the minerals management program under the suggested legislation would make possible the administration of mineral resources with a minimum expense. Should the results of such a program be adopted the Nation's economy would benefit by at least \$250 million a year.

Recreation

Annual visitor-use on the public lands in the California Desert is increasing at about five times the nationwide trend in recreation use.

A special survey of outdoor recreation on public lands in the Desert showed that nearly five million visitor-days were recorded in 1968. And yet, the Bureau now has staffing and facilities to handle less than one percent of the annual recreation use of the Desert. Consequently, virtually all recreation use of the Desert is now unregulated.

At our Nation's present rate of growth, we can expect 13.8 million visitor days by the year 2000. If the Bureau maintains its current management program, what will the Desert look like? And, also, what kind of a recreation experience will the visitor receive?

It is easy, therefore, to understand why we are sustaining extensive damages to historic and archaeologic sites along with soil and vegetative "erosion" and an overall deterioration of the scenic quality of the Desert. It is obvious why pollution — noise, visual, air — is permeating the area.

However, with a full recreation program, including identification of recreation use areas, coupled with a logical development and management program, the desert public lands could handle about 50 million visi-

tor-days of use by the year 2000. And it is possible that these 50 million visitors would enjoy a better environment than the five million visitors enjoy today.

The first phase of the California Desert Study pointed out that the Desert has the physical size and natural attributes essential to satisfy future recreation demands. It identified 19 areas that have exceptional recreational values. These areas should be managed to insure that these values are not impaired or destroyed. This is not to say that the remaining lands should be neglected. They are vital in the total recreation use of the Desert — it is significant to note that nearly four million recreation visitor-days were recorded outside of the 19 areas identified in the study.

What is needed now is a full recreation program that includes:

An ongoing inventory and study of desert recreationists and their activities that would provide additional data on existing use and information on recreation trends. Also, before a plan is developed or a construction program started, a study of natural resources is desirable. Information on the location and amount of resources available can help determine how much and where recreation activities will take place.

The development of a desert recreation master plan through analysis of existing and potential demands; cooperative planning efforts of city, county, State and

Federal governments; identification of sites or areas where recreation facilities can or should be located; and the possible use of consultants for advice on special situations.

The development of recreation facilities — the culmination of a sound inventory and planning process.

Time and effort to study different proposals on the operation and maintenance of recreation facilities

that would result from construction programs.

An analysis of a proposal to recruit and train qualified individuals as uniformed rangers who could provide information and protection for visitors and resources.

A study of staffing requirements to provide the necessary management for the Desert recreation program.

Protection and Safety

How much is a human life worth? Enough to warrant maintaining a system that assures visitors and workers in the California Desert some measure of protection? That provides a reasonable guarantee of freedom from man-made hazards? The fact is, however, there is now no system of protection and safety in the Desert. Yet the need is clearly evident — to provide not only for the safety and welfare of people, but to protect resources and property from damage or destruction. Even now, irreplaceable resources, such as petroglyphs, archaeological treasures, and historical sites are being destroyed. And of a more serious nature is the injury or death of a desert visitor.

The hazards in the desert range from flash floods to criminal offenses. The desert visitor must contend with bad roads improperly maintained or not maintained at all, few service stations, scarce water, poor communication, no patrol, getting stuck, vehicle breakdown, an occasional wildfire, mining shafts and excavations, abandoned structures, polluted water and people hazards.

These are but few of the hazards in desert areas frequented by visitors. Because of these hazards, the Federal government can expect to be faced with tort claims. Each week some group or agency is called upon to conduct at least one search-and-rescue mission

to find someone lost in the desert. Major crimes such as homicides, robberies, aggravated assaults, larcenies, and auto theft, and lesser offenses such as vandalism, resource trespass, and disorderly conduct are increasing as the number of visitor-days increases. An estimated 500 major crimes and 1,300 lesser offenses were committed in the desert in 1968, or about one offense per 1,000 visitor days.

The Bureau does not now have a protection system for the areas it administers. Funds, personnel, equipment and facilities are practically non-existent. Presently, the total Bureau personnel in the 16-million-acre desert area at any one time might total 10 men, and they are for resource management, not law enforcement and safety purposes. Laws and regulations are inadequate. Rules and regulations are generally unenforceable. Employees are not trained in law enforcement, make no arrests, are not authorized to carry or use firearms in the line of duty, cite no one regarding Federal law or regulation violation other than by Notice of Trespass, and are not able to bring violators of petty offense before a U. S. Commissioner or Magistrate. Protection coordination with local and State law enforcement offices is limited and is generally by telephone.

There is a critical interim planning need aimed at (a) completing a protection inventory, (b) eliminating hazards, (c) developing policy and objectives in protection, (d) determining organization and duties

of personnel, (e) obtaining enabling legislation, laws, and regulations, (f) publishing procedural manuals and guidelines, and (g) training personnel. At the same time that inventory and planning are taking place, the Bureau will need to continue to protect desert resources, visitors, and employees with the means it has.

A comprehensive plan for the public lands in the California Desert area should consider a protection system developed at some ultimate level of visitor population. The California Desert Study suggests this level at 50 million visitor-days per year. After consideration of alternatives, it appears that the best protection system at this ultimate level would be one based on a combination of systems used by the U. S. Forest Service and by the National Park Service. Law enforcement should be a coordinated team effort by local, State, and Federal law enforcement officials. Because of the desert's vastness, only a limited amount of

assistance could be expected from others; i.e., the California Highway Patrol and County Sheriff's Offices, and this assistance most likely would be in accordance with contractual terms.

Therefore, Bureau law enforcement personnel should be empowered to issue citations. Officers should be highly trained, and well qualified. Their duties should approximate those of the National Park Service Rangers; in fact, Bureau officers should be identified as Rangers. Many should hold local peace officer appointments. They should be trained and organized to handle normal search-and-rescue operations, riots and disasters. Their routine duties should be flexible to respond to changes. They should have the means to communicate quickly and to get to any part of the desert quickly. The protection system should be evaluated periodically by outside consultant law enforcement specialists and changed to keep up with the times.

Communication

In this era of micro wave and laser beam communications technology, the BLM is operating in the California Desert with less than smoke signal efficiency. Except in limited areas, there are now no means of rapid communications. Telephones are sparse and not in areas frequented by desert visitors. The few management personnel available cannot possibly adequately cover all the land where visitors go. The few desert radio systems operated by such agencies as the California Highway Patrol, Sheriff's Offices, and State Department of Fish and Game provide communication generally along major highway access routes. These systems are of limited value to the development of a desert network.

A modern communication system is crucial to efficient resource management and to the safety and well being of visitors and workers in the desert. The desert holds potential hazards, natural and man-made, to the unwary. Desert hazards include poisonous reptiles, abandoned mines, unexploded ordinance devices, steep cliffs, dangerous roads, flood areas, and severe storms. And in areas where temperatures soar above 100° F. five months a year, the mission of search and rescue can be a matter of life and death. As a public service, the Bureau must stand ready to answer visitor inquiries about traveling to and from the desert. With swelling numbers of visitors to the desert, the problem

of crime will increase significantly. Resource management, people safety and health services, effective crime prevention and detection, and law enforcement all depend on speedy communication.

The only practical, economical method of covering the California Desert is electronic communications. The best choice may be a highly sophisticated radio network which could cross the great desert distances and overcome its mountain barriers. Principal obstacles are that power sources are not generally available, access to key radio transmitter sites may be a problem, and extreme heat may jam the equipment.

A system must be developed immediately to meet the growing need to have instant, efficient contact in the vast reaches of the Desert. Such a system will benefit visitors and resource management agencies, including the California Department of Fish and Game, U. S. Border Patrol, Sheriffs' Offices, U. S. Bureau of Land Management, California Highway Patrol, and The National Park Service. Planning and development should be a joint, coordinated venture by these different agencies.

Transportation

In the California Desert, the transportation system has grown from a sparse network of native trails to a tremendous system of freeways, highways, and byways with railways and airports adding their effects. We have come a long way since Juan Bautista de Anza and Pedro Fages blazed the first trails across the Desert in the late 1700's. But the transportation system has been outstripped by the demands of a growing population. Some routes are adequate for future needs, but many others are poorly located and built, or fail to protect adequately the natural resources of the Desert. For the orderly development of public lands, a coordinated, comprehensive, long-range transportation plan covering freeways, highways, scenic routes, trails, rapid transit, and airport location is clearly needed.

Because of the size and variety of public pressures on the California Desert, every conceivable method of transportation must be considered. From supersonic jet fields to recreation strips. From multilane freeways to four-wheel drive trails. And from high-speed rapid transit systems to scenic walkways. Each system must be weighed for its effects upon the Desert.

As a resource management agency and as the largest landowner in the California Desert, the Bureau is charged with providing access to the public lands

there. But existing planning by the Bureau and other governmental units does not adequately provide for the future protection of the natural resources and utilization of these lands. And existing Department regulations do not provide for adequate coordination on the location and building of transportation facilities on these public lands. Unless something is done to coordinate these unregulated activities taking place on public lands, the result could be a deterioration of environmental amenities. Historic trails, for example, are not adequately protected and are in many cases in danger of being obliterated. Unwise use of land has destroyed much of the natural beauty of some sections of otherwise scenic routes. Deficiencies in road building have resulted in loss of material from unstabilized surfaces, and in development of parallel trails that scar the landscape. Clearly, restricted use of some areas is required to prevent disturbance of the Desert's vast beauty.

Generally accessible to visitors, the Desert holds potential hazards, natural and man-made, for the unwary. Accordingly, construction of transportation facilities should not invite the public into potentially hazardous areas without providing for their safety. A comprehensive transportation plan must consider not only the movement of people, but must help direct them to locations where they can enjoy the vastness of the Desert in comparative safety.

To properly analyze the current usage and its

effect upon the Desert environment as related to transportation, a committee type of approach should be instituted. Perhaps one of the existing committees, Council of Planning and Transportation Association of Southern California, or the Advisory Committee on a Master Plan for Scenic Highways, or both, could be made responsible for studying, analyz-

ing, and recommending to the Bureau work on transportation and access. This approach will provide for local, State, and Federal governmental coordination. To these existing committees additional membership including BLM could be added. To provide additional expertise, it may be advisable to form new committees.

Economics

Balancing costs against values — considering alternatives — setting up priorities — these are the tasks of the decision maker. To assist him, the planner turns to economic and other analyses. But the analyst's work is not simple by any means.

Certain uses of the Desert can be identified and tangible values assigned. Other uses have recognized values — many of which reflect individual preferences and value judgment that as yet cannot be quantified. Intangible benefits that cannot be measured in quantitative terms include clean air, open space, clean water, and other Desert amenities. Yet in economic analysis, both tangible as well as intangible values must be considered.

Included among the tangible resource benefits of the California Desert that can be quantified are recreation, mineral production, forage for livestock and wildlife, hunting and fishing, and the Desert lands themselves. Current recreation use in the Desert exceeds five million visitor-days annually. Applying a conservative value of \$2 per visitor-day as the amount the recreationist would be willing to pay if payment were required, the present value of the recreation opportunities is estimated at 10 million dollars annually. Anticipated recreation use in the year 2000 is estimated at 50 million visitor-days. Economic impact on Desert

communities from recreationists is also important. Expenditures by recreationists in Desert communities are assumed to average \$6 per person per day; roughly 30 million dollars could be considered a year's expenditures.

A recent inventory by the Bureau of Sport Fisheries and Wildlife estimated 1,900,000 visits related to wildlife, excluding fishing, to the California Desert, annually. If the visitor were required to pay for the experience, the value of these visits is estimated at five million dollars. Total expenditures related to the wildlife visits in the Desert area range from 11 to 30 million dollars annually. Although the percent of money spent in the Desert communities is unknown, the magnitude of total expenditures still has considerable impact on the Desert's economy.

Over 160 million dollars' worth of raw minerals are produced in the California Desert each year. Over the past five years, rate of production has risen by more than 24 percent. Of the salable minerals, sand and gravel represent the largest single sale.

Dependency on livestock forage from the public domain lands on the California Desert is not significant. However, approximately 20-25,000 cattle and 100-140,000 sheep participate in this use. Average figures indicate that approximately 176,000 animal unit months of forage are utilized by livestock each year

on these public domain lands in the **California** Desert.

The California Desert offers potential for irrigated agricultural use. Large areas of potentially irrigable lands exist in the Mojave Desert near Victorville, Barstow, Lucerne Valley, Yucca Valley, and the Coachella Valley. Irrigated acreages of the Imperial Valley could be expected to increase if water is available. The amount of irrigated acreage could increase over present levels by nearly 70 percent or two million acres.

If northern California water is delivered to the Desert to recharge underground reservoirs and developments are continued along the Colorado River, it would provide additional water for use. If so, a combination of long growing seasons, growing multiple crops annually, nearness of markets, and large land areas will enhance the value of some Desert lands for agriculture.

In addition to the potential for irrigated agriculture, certain Desert lands near existing communities are valuable for increased urban-suburban development. Expansion of industry in southern California may also result in new communities being carved out of the Desert lands.

In addition to tangible direct benefits, indirect benefits through enhancement of raw land values will occur in those areas of the California Desert near communities and developments, such as the Salton Sea. Speculative land purchases near Desert communities

will artificially inflate actual land values. And any type of Desert improvement, including Desert recreation facilities, will raise the price of the land itself.

In addition to direct and indirect benefits, there are also intangible and abstract values involved that are non-quantifiable, but which should nonetheless be considered. There are, in fact, compelling reasons to believe that development of the California Desert to its optimum level of resource production is not entirely amenable to the usual justification by economic determinations. By virtue of its size, scenic setting, climatic location, and existing and potential uses, the California Desert has social values at least equal to, if not in excess of, its economic values.

Well-being of people, preservation of resources, and total environmental enhancement are recognized national objectives. The American way-of-life includes outdoor recreation on a large scale, with benefits to the nation as a whole. Expenditures on outdoor recreation pursuits generate a multiplier effect on the State and national economy through the creation of new jobs and purchases of specialized equipment (e.g., dune buggies, motorcycles, trail bikes, camping equipment, pickup campers, etc.).

Of equal value is the need for conservation. It stems from the basic belief that Desert resources should not be despoiled, but maintained to ensure an adequate environment for the future. Conservation

of the physical resource base also includes the preservation of flora and fauna. Without adequate conservation measures, the Desert's resources will not be developed to their optimum levels of production, and could be lost to use by future Americans. Environmental enhancement, particularly the conservation of natural resources, is a national objective of increasing importance.

However, if we are to manage the Desert properly and are to identify the conflicts and interrelationships of resources, we need more definitive data. And the contribution of the various resources to the total economy can only be defined by further economic study, including data on input and output. Such information would provide the economic base for projecting use of all Desert resources at present levels and at future levels.

Future economic study can use much of the socio-economic information that already exists or data now being gathered by other Federal, State and local agencies, and private firms.

The major elements of a future economic study would include:

Inventory and analysis of economic activity in the Desert Area and its linkage to economic activity outside the area.

Development of a profile of the resources available in the Desert Area.

Development of a profile of demand variables or uses of the Desert's resources.

Projection of economic activity in the Desert Area for the years 1980 and 2000, based upon assumptions of continued economic growth and development.

Economic studies of the California Desert should commence at the same time resource inventories are started. This is particularly true of the input-output portion of future studies which would relate to the interaction between industries and sectors. This information would then be available to technical specialists conducting resource inventories for analysis of future demands for resource products.

Land Ownership

Land functions as a producer of renewable resources, source of non-renewable resources, and provides the base for man-made development and enjoyment. Today the California Desert with its special climate, including its "clean" air, has become an important arena in man's battle to keep his environment in balance. The Desert attracts many people because of the relative lack of air pollution, low humidity, and low pollen concentration.

The sparse population and excellent dispersion capacity of the atmosphere make the Desert an attractive site for future air polluting industries. At present, no policy exists to guide state and local government in decisions on Desert land use.

The more common land uses found to have a significant impact on the California Desert are non-resource oriented: (1) Urban-suburban, (2) local public purposes, (3) residential, (4) commercial, (5) industrial, (6) agricultural, and (7) land requirements of other government units, such as the armed services, the State, and natural resource agencies.

To provide for these uses on public lands requires careful consideration of the land's physical capability to support a particular use, knowledge of institutional factors such as planning and zoning affecting the lands,

and an awareness and appreciation of economic and social pressures influencing the land.

Any planning approach taken to identify these uses on the public lands in the Desert must be both comprehensive and orderly. Because of the large size of the area, coordination between the various conflicting and overlapping uses will require an early determination as to the approaches to be used.

To meet the requirements for lands for the purposes listed herein will necessitate determining needs for each type of use and evaluating the public lands as to the capability to meet the needs.

In support of resource activities in the California Desert, the Bureau will need to provide realty services. These services include work in land exchanges for both Bureau and other governmental agencies' programs, in acquiring access easements to aid resource management programs, and in transfer of lands required for specialized uses or which are not required for retention for resource management programs.

The planning effort for the realty activity lies in identifying and determining lands for title transfer and for consolidating land ownerships for more efficient administration.

It is estimated that about 10% (one million acres) of the public land in the Desert Study Area could be

transferred. A good portion of this acreage (100,000 to 300,000) may be used in exchange for private lands to aid other (than BLM) Federal programs. No estimate of the acreage necessary to effect BLM resource management programs can be made until over-all resource management decisions are adopted.

In addition to land disposals, realty services to the public include acting on applications that require less than fee grants. This includes land needed for public purposes whether it be in or out of Federal ownership.

Detailed planning is especially needed for public lands surrounding expanding metropolitan areas where marginal land, with steep slopes or unstable soils, for example, is often sought by speculators. An example of values that might be lost through improper planning is the situation of scattered tracts affected by expanding metropolitan areas. If planning is weak, or incomplete, these tracts might be sold without their public values being considered.

Two situations that have significant impact on the Desert environment relate to the handling of solid waste disposal and the need for open space areas. The magnitude of the solid waste problem is illustrated by the fact that Los Angeles County is number one in the State, with a solid waste load of more than 12½

million tons and San Bernardino County, number three with more than three million tons.

As to open space needs, the State of California, in a recent open space report of the State's largest urban-metropolitan region, identifies more than 669,000 acres of BLM Desert land as suitable for open space. Comprehensive planning would also greatly reduce efforts required to evaluate right-of-way proposals by identifying alternate routes and providing for the identification and resolution of resource conflicts. This approach would avoid unnecessary expenditures for later route change. Planning processes may also identify corridors needed to prevent haphazard patterns of rights-of-way and other utility uses across the Desert and to reduce the impact of visual pollution to the Desert environment.

The prospects for special studies of Desert lands for other use activities can be determined by knowing the answers to such questions as:

What is the potential for future agricultural developments in the Desert Area?

How will commercial development be affected by location of transportation routes, mineral and recreation development, and availability of water?

Will industrial development continue to be closely tied to processing of mineral extraction products?

What lands under military and reclamation withdrawals are suitable for restoration to public domain or where other uses might be permitted?

What are the pressures for residential lands in the Desert outside of expanding communities for recreational retreats?

What are the needs for open space and the availability of public lands for development of solid waste disposal and airport sites by public agencies?

Such prospects must be considered with the total environment. A large population or a high enough level of activity on the Desert could cause climatic changes with wide effects on the air space above the land.

Although about four million plus acres of the 11 million acres of public domain in the study area are surveyed, the remaining six million plus acres require an original survey or resurvey. The cadastral survey

is a key program in the planning process and is essential to the establishment and posting of public land boundaries in the Desert area.

Failure to start a comprehensive planning effort in the Desert Area will preclude the development of a balanced environment. Such a program is essential now because past and present experience in air pollution, expanding "slurbs," and current uses of public lands in the Desert show that our land resource of the future may be nonexistent or so changed in character that man's "progress" has destroyed nature's equilibrium. For example, the uncontrolled development of recreational homesites in the Desert areas under the Small Tract program has resulted in creating an irregular land pattern of public lands, development of blighted areas, and an administrative burden on the local governments. Man and nature can coexist providing man will understand his total environment. Such understanding requires a comprehensive evaluation of the land today.

Cooperative Relations

The BLM is administratively responsible for the largest land area in the California Desert. But in any management program, it cannot act unilaterally; instead, it must act in concert with other agencies at all levels. The Bureau will need to increase some of its cooperative activities with these other agencies. No changes may be necessary in others. Regardless of the size of the planning effort, all planning should be integrated into a system — one that benefits by the most modern management techniques for sound decision-making, including information retrieval and cost effectiveness studies.

The Bureau will need to determine what problems and conflicts may arise if it should begin a major planning and interim critical management program in the Desert. It will need to consider the mission and responsibilities of other agencies in the Desert and the supporting role it may have to assume to help other agencies in reaching their goals.

With the passage of the Classification and Multiple-Use Act (P. L. 88-607), and introduction of the Bureau's Planning System, the BLM can and should begin cooperative planning of the Desert. In this work, it would be concerned with the plans and programs of agencies in the Departments of Defense, Interior, Health, Education, and Welfare, Agriculture, Trans-

portation, Housing and Urban Development, and of the National Aeronautics and Space Administration.

The State of California can be expected to be deeply involved in any Desert management program because of its powers to influence planning for growth, development, and public welfare. Many of the activities of State agencies will affect how the BLM plans. The agencies include Resources, Business and Transportation, Finance, Economic Development, Human Relations, and the Coordinating Council for Higher Education. The possibilities for BLM-State cooperation in special programs center around educational opportunities, open space, solid waste disposal, airport facilities, industrial potential, development of land use codes, policy for land use, and expansion of photomapping.

The State government has delegated much of its power to local government units that over time have developed a strong tradition of home rule. These local units have an important role in planning for and controlling land use within local jurisdiction. Local government units within the Desert Area boundaries should participate actively in any comprehensive planning effort by the BLM.

The local agencies whose planning will be vital to the Bureau's Desert Study include counties, cities, associations of governments, and special districts. In

addition, it will be desirable for the Bureau to work closely with the Southern California Association of Governments — a six-county regional planning agency — to identify environmental problems and seek solutions on a regional basis. Within the Desert boundaries are five counties. Four other counties — each heavily populated — have a major impact on use of the Desert. Each of the nine counties have active planning commissions. Several cities within these coun-

ties have comprehensive master land use plans

An excellent possibility for BLM-County cooperation would involve a pilot effort in joint planning and development of land use controls for BLM managed multiple use lands.

There are also private landowners and major industries in the Desert Area, and they must be considered in cooperative efforts in the Desert.

Public Information

Some three-fourths of all the land on the California Desert is Public Domain land — it belongs to all the people of the United States.

In its role as steward of these lands, the Bureau of Land Management operates on a principle of public participation; that is, in the process of considering the uses of the land, BLM goes to the people, to keep them informed, and to consider their desires. This principle was clearly spelled out by Congress in the Classification and Multiple-Use Act of 1964.

The process of preparing a comprehensive plan for the Desert is a significant and major undertaking. It will require an extensive public information effort to insure a full and complete public understanding, and to secure an adequate public input into the plan.

But there is a more immediate and serious problem, which can perhaps best be identified as an information gap. There are presently more than five million recreation visitor-days spent on the public lands in the Desert each year, and untold numbers of individuals using the Desert for various other purposes. They are, for the most part, flying blind!

For their enjoyment and safety, and for the protection of the irreplaceable resources of the Desert, these people need information.

Maps, brochures, guidelines, and, where pertinent, information on regulations must be made available in

quantity. This should be done directly, through user groups, and through the communications media.

The desire for this kind of information, and the willingness of the public to respond positively, can well be illustrated in the national Johnny Horizon anti-littering campaign which has triggered a massive voluntary effort to keep the public lands clean, and through publications such as Room to Roam and the recreational maps series in California, which is only partially complete and has been curtailed because of a lack of funds.

The essence of the problem is that it is impossible to manage the use of public lands or to expect the public to be self-regulating if there is no two-way communication.

Therefore, it is urgent that immediate steps be taken to augment the information available to the public about the California Desert where such information is needed to protect the Desert resources and the Desert visitors themselves. This will include signs, maps, brochures, audio-visual materials, and work with communication media.

In looking to the future of the Desert, wise environmental management can only come about through people who understand the environment. Provision must be made in planning for the Desert to include adequate public information services both in the planning processes and for the ultimate use of the Desert.

CONCLUSIONS



A Comprehensive Plan

Throughout this report, one main theme continually recurs — the urgent need to develop an over-all or comprehensive plan. To develop such a plan, the Bureau needs more information about the location, amount and potential of the resources and the present and anticipated demands for them. It must plan to provide adequate protection and other public services, transportation, and communication facilities. It must determine what should be done to preserve the desert environment and to satisfy intensive public demands for new and expanded uses. It must consider the needs, plans and responsibilities of local, State and other Federal agencies, and of the private sector. And it must be able to plan systematically — within a framework that can establish goals, alternatives, and priorities; invite public participation; and balance costs against worth.

Traditionally, BLM served as a custodian of the public land. Proper management was precluded by unplanned land disposals and uncoordinated land and resource use under thousands of outdated public land laws. The growing demands for new land uses and for more services and facilities in the Desert conflicted with this traditional role. The Bureau was concerned, but unable to act because it lacked clearcut policy, adequate funds, manpower, and a systematic approach to planning for effective Desert management.

This problem is partially solved. The Bureau has established authority for multiple use management through legislation and department regulation. The Bureau planning system provides for systematic coordinated and multiple use decision making. But funding and manpower are not yet equal to the challenge.

System Characteristics

The new planning system affords the on-the-ground desert managers the opportunity to make land use decisions from a thorough inventory of existing resources, with knowledge of their potential and opportunities for development and use; the conflicts and problems presented; the physical, social, political and economic implications involved; the supportive functions needed; the alternatives available; and the overriding environmental amenities to be considered in planning.

The components of the planning system have three purposes: to provide guidance in the form of policy statements; to develop a base of information that should be considered in planning decisions; and to provide a format for making decisions.

Once decisions about the use and development of resources are made they serve as a guide and give direction to the preparation of individual resource activity plans. For example, suppose the planning process identifies the need for increased recreational facilities for an area in the desert heavily used by recreationists.

After evaluating the impact of this recreation demand on other resource uses and the environment, a decision consistent with policy guidance could be made to provide recreation facilities only at several locations where conflicts with other resources can be resolved and the recreational resource will not be destroyed. This constitutes a multiple-use decision that provides direction for the use of individual resources. The recreation resource plan for the area can then be prepared in accordance with that decision. The subsequent development of recreational facilities would be guided by the controls prepared for their construction, use, and maintenance.

The Bureau's Planning System is flexible because it can be applied to small or large areas and can be used by managers to determine the proper mix of resource utilization under the concept of multiple-use. It can also be used to solve particular resource problems. And the system is dynamic — it provides for updating plans to meet current and unforeseen demands on the resources. Resource planning decisions are not made in a vacuum.

Data Collection and Analysis

Data collection and analysis constitutes a major factor of this phase of the desert program. The necessity for conducting extensive inventories, surveys and studies results from the fact that the California Desert did not come under district office administration until

1962. Before then the area was under the jurisdiction of the Los Angeles Land Office, which was concerned exclusively with handling lands and minerals applications. The limited number of grazing leases were administered from the Bakersfield District Office. During the 30-year period that other Bureau district offices were gathering inventory data, little or no resource information was being compiled for the desert. Not until an accelerated effort was made during the past 1½ years by district, state office, and service center personnel in preparing the Phase I and Phase II Desert Study reports was any substantive knowledge gained about resource problems in relation to the heavy use by people. The primary effort of these groups was to inventory both information that is now available from other sources and to determine what further information is needed for comprehensive land use planning. A large volume of basic resource inventory and use data must be secured before comprehensive planning can take place. Research on items of a similar nature must be consolidated to avoid duplication of effort, such as vegetation inventory to accommodate the range, watershed, wildlife, recreation and ecological study programs.

Public Participation

The Bureau Planning System stresses the need for public involvement throughout the planning process. The participation of any agency or group will vary ac-

according to their mission, responsibilities, and interest in specific land areas. Some will be concerned with programs affecting the use of natural resources and the health, safety and general welfare of the people. Others will be concerned about preserving the ecological balance of the desert environment.

The Bureau anticipates there will be three definite areas of opportunity for participation for the Federal, State and local government agencies and private groups involved in the preparation of a desert plan and in the development of an interim critical management program. These are:

1. Assisting with the development of an information base for the resources, uses, and supporting activities discussed in this report. This will necessitate the Bureau accumulating information on the plans of all governmental agencies and user groups, which will have an impact on the management of desert land;
2. Assisting in reconciling resource conflicts as they arise, making the Bureau aware of alternatives, and making positive recommendations for resolving resource problems and establishing resource use rules;
3. Assisting with the development and implementation of an interim program of management to protect against destruction of fragile desert resources and to protect people now using the

desert from a variety of hazards. Local agencies and user groups could effectively assist the Bureau with regulation of desert uses and with the dissemination of information relating to the desert (such as what resources are found there, what type of communication-transportation networks exist, and what safety programs have been designed for desert users).

Constraints for Use

However appropriate the planning system is for comprehensive planning in the Desert, the competition for resources is increasing so rapidly, resource information is so lacking, and resource values have such a major social and economic significance on local, regional and national levels, that only by a concentrated planning effort can the Bureau prepare to accommodate the public demands for the resources without an adverse impact on the desert environment.

If the Bureau were to proceed under present funding and manpower limitations, it would take over 20 years to develop the resource information base and to prepare comprehensive plans for the 11 million acres of public desert lands. The preparation and implementation of detailed action programs designed to accomplish planning goals would add several more years to that time.

The Desert cannot stand the additional abuse caused by uncontrolled uses and increased competition for that long. Public use of the desert resources also cannot await a long drawn-out planning effort.

Critical Management

Many of the resource values in the Desert face imminent loss or destruction. Many other resource values have not yet been explored or understood. There is an urgent need to develop an action program to protect and preserve those values that might be lost. The desert environment must be protected while knowledge is gathered to make use of the desert resources properly.

Essentially this means that any interim decisions regarding desert land use must be made cautiously and thought out thoroughly in terms of the total environment. The possibilities of inducing further pollution to air, water, visual and noise must be considered and minimized. Endangered plants and animals, scientific and cultural values must be preserved. And man himself must be protected, not only from the hazards of the desert but also from the actions of other men.

The primary management conflicts center on the control of uses that destroy the vegetative cover or destroy a stable soil mantle. Chief among these uses are the off-road vehicle use, unregulated livestock grazing, mineral exploration, unregulated vegetation harvesting, and improper or unplanned road construction. The study to date has pointed out several areas wherein immediate action is necessary.

1. Some controls must be established to limit off-

road vehicular use where vegetative and soil losses occur.

2. Unregulated harvesting of the rare vegetative species such as Barrel Cactus, Saguaro Cactus, Ironwood, and others, must be stopped.
3. Pollution of desert springs by various uses (mining, recreation, and livestock principally) must be brought to a halt.
4. Certain key vegetative areas need immediate protection; for example, Crucifixion Thorn, the Jaeger Joshua Tree and the Desert Lily.

The critical management problem with the wildlife resources has to do with the identification and preservation of the habitat of several rare endangered species. The action program should be designed to preserve the habitat of the rare endangered fish and wildlife species immediately.

Immediate action must be taken to stop livestock use on those areas highly susceptible to other resource damage.

Certain key resources are at this moment being destroyed by the building of roads, camping, mining, recreational use, "pot hunting," and other uncontrolled public uses. These areas should be protected immediately by whatever means are available on an emergency basis. A few examples of damage occurring now include the Giant Indian Intaglios in the Yuha Desert, which are being obliterated by vehicles; many petroglyph-pictograph sites accessible to well-maintained

roads which are being vandalized and ruined; and sand and gravel removal operations on archaeological sites in Imperial County which are ruining the sites.

A program to determine validity of mining claims should be started in those areas that have been segregated from the operation of the mining laws. Contests should be initiated where absolutely essential when land is needed for intensive public purposes.

Plan, program, build, and operate a Desert Center and a system of Way Stations in the Desert to further a conservation education program on desert environment and to foster understanding of the fragile nature of the desert. Cooperative arrangements should be made with institutions of higher education to develop this program.

An adequate system to protect people from hazards and resources from damage is needed. Legislation is proposed that would give BLM officers law enforcement authority with power to issue citations. A uniformed Ranger force working closely with existing law enforcement agencies is recommended to provide visitor safety, protection, search and rescue capability, natural resource protection, fire control, general safety, including traffic control and facility inspection expertise.

Whenever the elements of safety, public welfare, and damage potential are present it is mandatory that a dependable and efficient communication system be available. An electronic communication system is recommended as the only practical and attainable method

of providing for visitor safety, enforcement, and efficiency of operation. This is a high priority consideration because of the heavy, already demonstrated, need.

There is an urgent need to establish some method whereby BLM can participate in road building decisions with other road building entities. This is necessary to protect resource values, make other resources available, avoid duplication of construction, and generally insure as little environment disruption as possible.

The major management recommendation concerning the lands program is to be extremely careful in any title transfer in the desert area pending completion of comprehensive planning. Such transactions may detract from environmental quality or complicate future management of the remaining public lands or conflict with the plans of local governments.

Critical Management Actions

During the five-year period that the vital research and plan formulation are being conducted, other interim protection actions are needed to retard or halt significant losses of resource values taking place in critical areas. To avert these losses and to get an on-the-ground program moving, a four pronged approach has been developed. This consists of (1) the establishment of a uniformed ranger protection and maintenance operation (2) protection of threatened irreplaceable biological, historical, and scientific resources. (3) control of destructive and damaging uses, and (4) the expansion of a conservation education program.

